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Energy Research Abstracts

ABSTRACTS 17907-19622

Technical Information Center
UNITED STATES DEPARTMENT OF ENERGY

CURRENT AWARENESS PUBLICATIONS ON ENERGY

To provide complete coverage of literature related to major Department programs, announcement publications which are comprehensive in their coverage of certain energy fields are issued regularly. All information in these publications, plus additional backup information, is included in the energy data base of the Technical Information Center; all references are also available for machine searching via the on-line retrieval system, DOE/RECON. Descriptions of these current awareness publications, which are supported either directly or indirectly by the DOE, appear below.

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A monthly abstract journal devoted to the analysis of energy research, conservation, and policy. Scope and coverage are limited to substantive articles or reports and emphasize the following: programmatic efforts; legislative, regulatory, and other legal aspects; social, economic, and environmental impacts; regional and sectoral analyses; institutional factors, etc. *EAPA* is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402; domestic subscribers $3.00, foreign $3.75 per copy; annual cumulative index, domestic $4.00, foreign $5.00 per copy. The annual subscription price is $38.00 for domestic subscribers and $47.50 for foreign subscribers.

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A monthly publication providing abstracting and indexing coverage of the international patent literature, including patent applications, that concerns any aspect of energy production, conservation, and utilization. Available as PB81-902800.

Energy Conservation Update (ECU)

A monthly abstract journal devoted to current information on energy conservation in buildings, transportation and propulsion, and industry; waste processing plants and equipment; energy storage; energy conversion; advanced automotive systems; combustion systems; power cycles; synthetic fuels; and power transmission. Available as PB81-914800.

Energy and the Environment (EAE)

A monthly abstract journal devoted to information on the impacts of energy-related activities and radioactive and nonradioactive pollutants on the environment. Available as PB81-914900.

Fossil Energy Update (FEU)

A monthly abstract journal devoted to information on the processing and use of fossil fuels. Available as PB81-914600.

Fusion Energy Update (CFU)

A monthly abstract journal devoted to information on controlled thermonuclear research. Available as PB81-915300.

Geothermal Energy Update (GEU)

A monthly abstract journal devoted to information on the exploration and development of geothermal resources. Available as PB81-914700.

Solar Energy Update (SEU)

A monthly abstract journal devoted to information on the utilization of solar, tidal, and wind energy. Available as PB81-914500.

Synthetic Fuels Update (SFU)

A monthly abstract journal devoted to information on coal gasification; coal liquefaction; other coal processing; biomass conversion to fuel; shale oil and tar sand bitumen production; hydrogen fuels; other hydrocarbon fuels; alcohol fuels; and inorganic hydrogen compound fuels. Available as PB81-902700.

INTERNATIONAL ENERGY PUBLICATIONS

Atomindex (Published in cooperation with the Technical Information Center by the International Atomic Energy Agency, International Nuclear Information System, Vienna, Austria)

A semimonthly abstract journal devoted to information on nuclear science and technology. Through an exchange agreement, IAEA/INIS provides all non-U. S. nuclear information of *Atomindex* to TIC for inclusion in the DOE/RECON Data Base; in turn, TIC provides all U. S. nuclear information to IAEA/INIS for inclusion in *Atomindex*. *Atomindex* is available by subscription from UNIPUB, P.O. Box 433, Murray Hill Station, New York, NY 10016. The cost of an annual subscription, 24 semimonthly issues and semiannual and annual cumulative indexes, is $150.

Coal Abstracts (Published in cooperation with the Technical Information Center by the International Energy Agency, IEA Coal Research, London, England)

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EDITOR'S NOTE

The Report Number Index of ERA Vol. 6, No. 11 dated June 15, 1981, was truncated at page 152R. The remainder of the entries for that index is listed on these insert pages.

The Semiannual Index, which should reach you within 60 days, contains the entire index, so it is hoped that the inconvenience presented by the insert will be minimal and short-lived.

David E. Bost
Editor

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ENERGY RESEARCH ABSTRACTS

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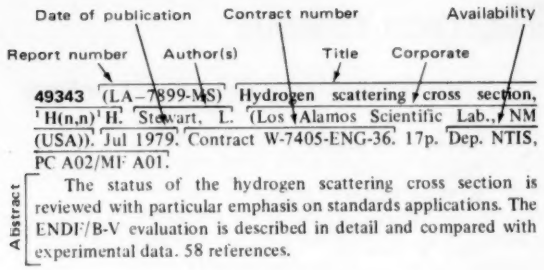
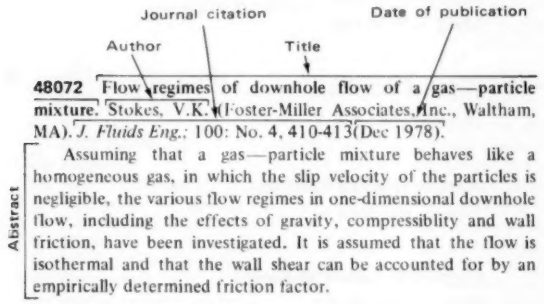
The principal elements of abstract entries for a typical research and development report and a typical technical journal article are illustrated below.


Date of publication
Contract number
Availability
Report number
Author(s)
Title
Corporate
49343 (LA–7899-MS) Hydrogen scattering cross section, $^1H(n,n)^1H$. Stewart, L. (Los Alamos Scientific Lab., NM (USA)). Jul 1979. Contract W-7405-ENG-36. 17p. Dep. NTIS, PC A02/MF A01.
Abstract
The status of the hydrogen scattering cross section is reviewed with particular emphasis on standards applications. The ENDF/B-V evaluation is described in detail and compared with experimental data. 58 references.


Journal citation
Date of publication
Author
Title
48072 Flow regimes of downhole flow of a gas—particle mixture. Stokes, V.K. (Foster-Miller Associates, Inc., Waltham, MA). J. Fluids Eng.; 100: No. 4, 410-413 (Dec 1978).
Abstract
Assuming that a gas—particle mixture behaves like a homogeneous gas, in which the slip velocity of the particles is negligible, the various flow regimes in one-dimensional downhole flow, including the effects of gravity, compressiblity and wall friction, have been investigated. It is assumed that the flow is isothermal and that the wall shear can be accounted for by an empirically determined friction factor.

• INDEXES TO *ENERGY RESEARCH ABSTRACTS*

Five indexes are provided for approaching the contents of each issue of *Energy Research Abstracts (ERA)*. These indexes are cumulated semiannually and annually. Each index is preceded by an introduction that details the organization of the index and the principles by which it was compiled. The reader is referred to these introductions for information not found in the index examples that follow.

• Corporate Index

Technical report literature is indexed using the name of the organization or institution responsible for the issuance of the report.

49343 (LA–7899-MS) Hydrogen scattering cross section, $^1H(n,n)^1H$. Stewart, L. (Los Alamos Scientific Lab., NM (USA)). Jul 1979. Contract W-7405-ENG-36. 17p. Dep. NTIS, PC A02/MF A01.

is indexed as:

Los Alamos Scientific Lab., NM (USA)
Advanced laser fusion target fabrication research and development proposal, 4:48249 (LA–7619-P)
Hydrogen scattering cross section, $^1H(n,n)^1H$, 4:49343 (LA–7899-MS)

• Author Index

Each author's name is indexed in the form appearing on the document abstracted, with the exception that given names are reduced to initials:

Stewart, L., Hydrogen scattering cross section, $^1H(n,n)^1H$, 4:49343 (LA–7899-MS)
Stewart, M.D., *See* McInroy, J.F., 4:49280
Stewart, W., *See* Dean, J.W., 4:48543
Stimson, J., Reproduction, growth, and survival of Enewetak corals, 4:49200 (NVO–0703-1, pp 56-59)

• Subject Index

The subject index consisting of entries naming specific materials, objects, and processes is arranged alphabetically. Document titles and informative phrases, or both, specific to these entries are arranged alphabetically under the entries.

HYDROGEN I TARGET
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HYDROGEN NITRATES
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Research Programs
Inventory of advanced energy technologies and energy conservation research and development: 1976-1978. Volume II. Prepared for the Committee on Science and Technology, U.S. House of Representatives, 96*th* Congress, 4:48749.

• Contract Number Index

DOE technical report literature is indexed using contract numbers. This index contains the contract number with corresponding abstract and report numbers.

W-7405-ENG-36	**Los Alamos Scientific Lab., NM (USA)**	
	3:49698	LA-tr–78-45
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W-7405-ENG-48	**California Univ., Livermore (USA). Lawrence Livermore Lab.**	
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	3:49431	UCRL–52405

• Report Number Index

Technical report literature is also indexed using report numbers. This index includes information on where individual reports may be obtained. Patents and conference papers are indexed here as a matter of convenience.

LA-		
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01 COAL AND COAL PRODUCTS

REFER ALSO TO CITATION(S) 18742

17907 (ORNL—5727) Fossil energy program. Quarterly progress report for period ending December 31, 1980. McNeese, L.E. (Oak Ridge National Lab., TN (USA)). Apr 1981. Contract W-7405-ENG-26. 409p. NTIS, PC A18/MF A01.

This quarterly report covers the progress made during the period October 1 through December 31 for the Oak Ridge National Laboratory research and development projects that are carried out in support of the increased utilization of coal and other fossil fuels as sources of clean energy. These projects are supported by various parts of DOE including Fossil Energy, Basic Energy Sciences, Office of Health and Environmental Research, Office of Environmental Compliance and Overview, Economic Regulatory Administration, Policy and Evaluation, Resource Applications, by the Electric Power Research Institute, and by the Tennessee Valley Authority and the EPA Office of Research and Development through interagency agreements with the DOE.

17908 (ORNL/TM—7723) Fossil energy program. Progress report for January 1981. McNeese, L.E. (Oak Ridge National Lab., TN (USA)). Mar 1981. Contract W-7405-ENG-26. 111p. NTIS, PC A06/MF A01.

This report - the seventy-eighth of a series - is a compendium of monthly progress reports for the ORNL research and development programs that are in support of the increased utilization of coal and other fossil fuel alternatives as sources of clean energy. The projects reported this month include those for coal conversion development, chemical research and development, materials technology, component development and process evaluation, technical support to major liquefaction projects, process analysis; and engineering evaluations, fossil energy environmental analysis, flue gas desulfurization, solid waste disposal, coal preparation and waste utilization, plant control development, atmospheric fluidized bed coal combustor for cogeneration, Tennessee Valley Authority Fluidized Bed Combustion demonstration plant program technical support, PFBC systems analysis, fossil fuel applications assessments, performance assurance system support for fossil energy projects, international energy technology assessment, and generalized equilibrium models of liquid and gaseous fuel supplies.

0104 Processing

REFER ALSO TO CITATION(S) 17932, 17935, 17937, 17941, 17950, 17950, 18063, 18536

17909 (BNL—51079) Validation of the materials-process-product model (coal SNG). Albanese, A.; Bhagat, N.; Friend, L.; Lamontagne, J.; Pouder, R.; Vinjamuri, G. (Brookhaven National Lab., Upton, NY (USA). National Center for Analysis of Energy Systems). Mar 1980. Contract AC02-76CH00016. 45p. NTIS, PC A03/MF A01.

The use of coal as a source of high Btu gas is currently viewed as one possible means of supplementing dwindling natural gas supplies. While certain coal gasification processes have demonstrated technical feasibility, much uncertainty and inconsistency remains regarding the capital and operating costs of large scale coal conversion facilities; cost estimates may vary by as much as 50%. Studies conducted for the American Gas Association (AGA) and US Energy Research and Development Administration by C.F. Braun and Co. have defined technical specifications and cost guidelines for estimating costs of coal gasification technologies (AGA Guidelines). Based on the AGA Guidelines, Braun has also prepared cost estimates for selected coal gasification processes. Recent efforts by International Research and Technology Inc. (IR and T) have led to development of the Materials-Process-Product Model (MPPM), a comprehensive anaytic tool for evaluation of processes and costs for coal gasification and other coal conversion technologies. This validation of the MPPM presents a comparison of engineering and cost computation methodologies employed in the MPPM to those employed by Braun and comparison of MPPM results to Braun cost estimates. These comparisons indicate that the MPPM has the potential to be a valuable tool for assisting in the evaluation of coal gasification technologies.

17910 (DOE/ET/10069—T1(Vol.1)) EDS coal liquefaction process development. Phase V. EDS commercial plant study design update. Illinois coal. Volume 1. Main report. Epperly, W.R. (Exxon Research and Engineering Co., Florham Park, NJ (USA)). Mar 1981. Contract AB01-77ET10069. 270p. (FE—2893-61(Vol.1)). NTIS (US Sales Only), PC A12/MF A01.

The objectives of the Study Design Update (SDU) were to identify the technical issues facing a potential commercial-size EDS plant design; to provide a reliable basis for estimating the cost of EDS products; and to furnish research guidance to the EDS Project. The SDU consists of two distinct studies in which different processing schemes are used to produce the hydrogen and fuel gas required by the plant. These studies are referred to as the Base Case and the Market Flexibility Sensitivity Case. In the Base Case, hydrogen is generated by steam reforming of the light hydrocarbon gases produced in the plant. Fuel gas is generated by feeding the bottoms stream from the liquefaction section vacuum pipestill to a FLEXICOKING unit. In the FLEXICOKING unit reactor, the bottoms stream is converted to coke; additional liquid product is also recovered. The coke is converted to low-Btu fuel gas in the FLEXICOKING unit gasifier. In the Market Flexibility Sensitivity (MFS) Case, the bottoms stream from the vacuum pipestill is split, and about half is sent to the FLEXICOKING unit for recovery of additional liquid product and production of fuel gas. The remainder of the bottoms stream is converted to hydrogen in a Partial Oxidation Unit. Hence the MFS Case does not consume light hydrocarbon gases produced and they are available for sale. The study of these two cases has demonstrated the importance of bottoms process selection to the economics and thermal efficiency of an EDS plant. Volume 1 - Main Report has been developed to be a standalone document. Both the Base Case and Market Flexibility Sensitivity (MFS) Case are covered. This volume includes an overview and detailed case summaries. It also covers economics, product recovery factors, material and energy balances, cost estimates and enviromental considerations.

17911 (DOE/ET/13153—T4) Short residence time hydropyrolysis of coal. Technical progress report, 1 July-31 September 1980. Saville, D.A.; Russel, W.B. (Princeton Univ., NJ (USA). Dept. of Chemical Engineering). 1980. Contract AC01-79ET13153. 14p. NTIS, PC A02/MF A01.

In this quarterly report we update the status of the program to gather kinetic data for the pyrolysis and hydropyrolysis of coal and the combined theoretical and experimental effort to understand the role of plasticity in these processes.

17912 (DOE/MC/08450—T1(Vol.2)) Modeling of wet-gas cleanup: Task 13. Final technical report. Volume II: code documentation. Cronin, J.F. (Physical Sciences, Inc., Woburn, MA (USA)). Nov 1980. Contract AM21-78MC08450. 107p. (PSI-TR—225B). NTIS, PC A06/MF A01.

This report contains general instructions for using FRCNJT, free-confined jet program, which models humidification chamber performance in the METC Wet Gas Cleanup system. The equations utilized in the code are fully described in Volume I (PSI TR-225). These instructions will familiarize the user with the input/output aspects of the code. Section II describes the basic structure of the program and the required inputs. Two forms of output are provided by the program: plots and numbers. A description of the printed output files and a general outline of the input and use of the plotting code is provided in Section III. Appendix A contains a full listing of the computer code as utilized at Physical Sciences Inc. The program, written in FORTRAN, has been fully tested on a Prime 400 computer and results are presented in Volume I. Appendix D contains a full listing of the plotting program. This program is also written in FORTRAN, however, the plotting subroutines are machine dependent. These routines are similar to Calcomp plotting subroutines, and a few modifications may well be needed to make the program operational on computers other than Prime.

17913 **(DOE/MC/14361—T1) Empirical systems model of the Westinghouse fluidized-bed PDU coal gasifier. Task report No. 1.** Kemp, N.H. (Physical Sciences, Inc., Woburn, MA (USA)). Dec 1980. Contract AC21-80MC14361. 27p. (TR—246). NTIS, PC A03/MF A01.

A systems-level model of the Westinghouse PDU coal gasifier has been constructed based entirely on the data gathered during testing of this gasifier. It represents a purely empirical attempt to correlate the published data by means of multiple linear regression analysis, leading to prediction equations for output variables as linear combinations of a number of input variables. The prediction equations so derived do not have any physical laws incorporated into them explicitly. They rely entirely on measurements of the physical processes going on in the gasifier-cyclone combination. However, the choice of relevant input variables was made with the help of some intuition about the variables which affect these physical processes, based on work performed at PSI to model coal gasifiers. It should also be noted that the data comes from engineering tests which were not necessarily designed to produce systematic variation of all variables, so the data may contain some biases about which variables are varied. The computer implementation of the model is very fast and simple. For each output variable a set of 11 coefficients are prescribed. To obtain a predicted value of that output variable, for a specified set of values of the 10 input variables, a linear combination (dot product) of the 10 input variables is formed, using the 11 coefficients. The use of this empirical model is restricted to predictions for the Westinghouse PDU coal gasifier (and associated cyclone) within the range of operating variables represented in the data base. In particular, all the data involve operation on Pittsburgh Seam Coal. However, there is a range of coal feed rates, and both air-blown and oxygen-blown runs were included.

17914 **(DOE/PC/30026—2) Study of ebullated-bed fluid dynamics for h-coal. Quarterly progress report No. 2, October 1-December 31, 1980.** Schaefer, R.J.; Rundell, D.N. (Amoco Oil Co., Naperville, IL (USA). Research and Development Dept.). Jan 1981. Contract AC22-80PC30026. 55p. NTIS, PC A04/MF A01.

Analysis of data from the fluid dynamics tests performed at Hydrocarbon Research, Inc., during Run PDU-10 was started. Data in the computer files were cross-checked with the original notebooks to verify accuracy. Gamma-ray mass absorption coefficients for material in the PDU reactor were calculated using characterization of selected oil and catalyst samples. Battelle Institute began viscosity measurement of PDU reactor liquid samples. Northwestern University began shakedown of the 6″ diameter test stand. Model fluids were selected and charged to the unit. Optical components were designed and assembly was started.

17915 **(DOE/PC/30041—T3) Development and application of analytical techniques to chemistry of donor solvent liquefaction. Quarterly progress report, October 1980-December 1980.** Dorn, H.C.; Taylor, L.T. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA)). Apr 1981. Contract AC22-80PC30041. 18p. NTIS, PC A02/MF A01.

The LC-ICP interface which can simultaneously detect (ICP) and speciate (LC) up to 34 elements at concentrations between 10 ppM and 0.5 ppB depending on the element and the matrix has been developed. A variety of organic matrices have been successfully used. Preliminary experiments using this interface have monitored 15 elements simultaneously (Al, Ca, Cd, Co, Cr, Cu, Fe, Hg, Mg, Mn, Mo, Ni, Ti, V and Zn). The mode of separation of process derived coal liquefaction solvents and Amax solvent refined coal has been size exclusion chromatography. The metals present in a process solvent obtained from the SRC Wilsonville, AL facility and metal distribution according to effective molecular size are presented. Very low levels of Mg, Mn, Ti, Cd and Hg are observed. Of the elements which were monitored, Cr surprisingly exhibits the largest concentration unlike the other coal-derived materials which have been examined via LC-ICP. The source of Cr in this case may well be from corrosion of the reactor equipment. Both Cr and Fe show a similar molecular size distribution with most of the material eluting near the totally excluded volume. Cu and Zn, on the other hand, show a much smaller size distribution with Cu having at least two groups of sized species; while, Zn appears to be incorporated in a relatively small number of single sized species. The remainder of the elements monitored did not show detectable peaks above ambient noise level. A moderately hydrotreated process solvent that had been previously separated into four distillation ranges: IBP (initial boiling point) -800°F, 400 to 800°F, 400 to 600°F and 600 to 800°F was subjected to SEC-ICP using pyridine as the eluting medium. Size exclusion chromatographic metallograms are presented for calcium, magnesium, titanium, iron, copper and zinc.

17916 **(DOE/PC/30041—T4) Development and application of analytical techniques to chemistry of donor solvent liquefaction. Quarterly progress report, July 1980-September 1980.** Dorn, H.C.; Taylor, L.T. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA)). Apr 1981. Contract AC22-80PC30041. 22p. NTIS, PC A02/MF A01.

The technique of LC-ICP has been illustrated employing size exclusion separation for organically bound metal species with toluene eluent. To eliminate carbon build-up and abnormally high nebulization efficiencies, a thermostated spray chamber was developed which yielded detection limits in toluene ten to a hundred times lower than measured with conventional spray chambers. Extension of this work to the speciation of organometallics in nonaqueous solvents is underway.

17917 **(DOE/PC/30055—1) Supported metal carbonyls: new catalysts for the indirect liquefaction of coal. Semiannual report for period to July 1, 1980.** Melson, G.A. (Virginia Commonwealth Univ., Richmond (USA). Dept. of Chemistry). 1980. Contract AC22-80PC30055. 5p. NTIS, PC A02/MF A01.

The synthesis, characterization and evaluation of two series of supported metal catalysts have been achieved during the first six months of the contract period. The first series of potentially catalytic materials consisted of iron and cobalt and iron/cobalt mixtures on synthetic zeolite supports; the second series comprised iron and iron/molybdenum, iron/manganese and iron/ruthenium mixtures on oxide supports. The materials were prepared by using procedures recently reported. Characterization of the materials was accomplished both in our laboratories at Virginia Commonwealth University and also by using facilities in the Analytical Chemistry Division at PETC; techniques employed included x-ray diffraction, ion-scattering spectrometry, secondary ion mass spectroscopy, electron spectroscopy for chemical analysis, scanning electron microscopy and thermogravimetric analysis. The ability of the prepared materials to catalyze the hydrogenation of carbon monoxide was evaluated by using micro-reactors in the Process Sciences Division at PETC.

17918 **(DOE/PC/30055—2) Supported metal carbonyls: new catalysts for the indirect liquefaction of coal. Final report for period to December 31, 1980.** Melson, G.A. (Virginia Commonwealth Univ., Richmond (USA). Dept. of Chemistry). 1980. Contract AC22-80PC30055. 5p. NTIS, PC A02/MF A01.

The synthesis of two series of supported metal catalysts has been achieved. The first series consisted of iron on the oxide supports, MgO, ZnO, TiO_2, Al_2O_3, SiO_2 and ThO_2; the second com-

prised iron, cobalt and iron/cobalt mixtures on the zeolite supports ZSM-5, NU-1, mordenite and 13X. All potentially active catalytic materials were prepared by techniques developed in our laboratory during the previous contract period using metal carbonyls as the source of the metal component; metal loadings ranged between 1 and 20%. Characterization of some of the materials was achieved by using the techniques of x-ray powder diffraction, ion-scattering spectrometry, secondary ion mass spectroscopy, electron spectroscopy for chemical analysis, scanning electron microscopy, Moessbauer spectroscopy and thermogravimatric analysis. Evaluation of the catalytic ability of some of the materials for the hydrogenation of carbon monoxide was conducted.

17919 **(DOE/PC/30228—T1) New catalysts for the indirect liquefaction of coal. Semi-annual technical report.** Melson, G.A. (Virginia Commonwealth Univ., Richmond (USA)). 1981. Contract FG22-80PC30228. 16p. NTIS, PC A02/MF A01.

The syntheis and characterization of two series of supported metal compounds has been achieved during the initial period of grant support. These potentially catalytic materials were prepared from transition metal carbonyls and both simple oxide and zeolite supports by a newly-developed synthetic procedure; spectroscopic and thermogravimetric techniques have been employed for characterization. Evaluation of the ability of some of these materials to catalyze the hydrogenation of carbon monoxide has been completed. Product distributions which are significantly different from those which are obtained by using conventionally prepared catalysts are produced with some of these new materials.

17920 **(DOE/TIC—11447) Coal-gasification instrumentation program (PR 11734). Quarterly progress report, January 1, 1981-March 31, 1981.** (Los Alamos Scientific Lab., NM (USA)). 30 Mar 1981. Contract W-7405-ENG-36. 20p. NTIS, PC A02/MF A01.

In the experimental effort to define the capabilities of infrared absorption spectroscopy for the analysis of coal gasifier product gases, we have continued spectral observations on minority species in the gas phase, and are proceeding with spectroscopic studies of the same materials in cryogenic solution. The progress reported has to do primarily with the characteristics of N_2O and NO_2. Coherent anti-Stokes Raman spectroscopy (CARS) is a promising spectroscopic technique for on-line, real-time diagnostics of species concentrations and temperature in the gas streams of coal gasifiers. Our present work is directed toward the development of an appropriate data base for CARS of several constituents of coal-gasifier streams, both separately and mixed, under laboratory conditions of pressures up to 1000 psi and temperatures up to 500 K, with emphasis upon detection of trace concentrations of certain minority species. During this reporting period, we have continued measurements of CARS signals from mixtures containing H_2S and have completed modification of our experimental configuration to permit normalized CARS and Coherent Stimulated Raman Spectroscopy (CSRS). The aim of our measurements of CARS signals from mixtures containing H_2S is to determine the detection sensitivity for a field-worthy CARS diagnostic system, with an ultimate goal of 1 ppM. Preparations have been made for the upcoming quantification experiments for LIBS. These are still in progress, since we continued preparatory work by studying time-resolved LIBS, or TRELIBS. This modification of the basic spectral detection technique offers great advantages in sensitivity and diagnostic simplicity.

17921 **(FE—2494-TR-3) Some aspects of the mechanism and kinetics of coal liquefaction.** Szladow, A.J.; Given, P.H. (Pennsylvania State Univ., University Park (USA). Coal Research Section). Jan 1980. Contract AC22-76ET10587. 184p. NTIS, PC A09/MF A01.

Various processes are under development at the pilot plant stage for the conversion of coals to low-sulfur liquid fuels, using a hydrogen-donor solvent, a high partial pressure of hydrogen and, in some cases, a catalyst. It was the objective of this study to contribute to the understanding of the process chemistry of coal liquefaction by investigating some aspects of the mechanism and kinetics. In the experimental design, the conversion of coals to products having various solubility characteristics was studied in small batch reactors in the presence of tetralin as hydrogen donor solvent. The relationships between the generation of materials of different solubilities and the removal of oxygen functional groups for coal/tetralin interactions, at temperatures 340 to 400°C and relatively short times, were studied to provide quantitative information helpful in assessing various hypotheses about the role of oxygen functional groups in the early stages of liquefaction. The effect of hydroxyl oxygen on the benzene solubility of the products was elucidated by substituting hydroxyl groups in the pyridine-soluble material with trimethylsilyl. Studies of the effect of temperature on rates of conversion were performed with the object of shedding additional light on the reactions taking place during short contact times. The implication of the results to the modeling of coal liquefaction kinetics was explored.

17922 **(FE—3397-7) Studies in coal liquefaction with application to the SRC and related processes. Quarterly report, May-July 1980.** Guin, J.A.; Tarrer, A.R. (Auburn Univ., AL (USA). Coal Conversion Lab.). 1980. Contract AC22-79ET13397. 104p. NTIS, PC A06/MF A01.

Because of the three-phase, solid-liquid-gas nature of most coal liquefaction reactions, the opportunity presents itself for significant mass transfer limitations in the rate of the overall process. To better characterize the degree of mass transfer in coal liquefaction systems, a detailed study of mass transfer in several types of coal liquefaction reactors has been begun. The methodology employs a model oxygen-sulfite reaction system to provide the needed information. This report presents the mass transfer characteristics of a batch magnedrive autoclave reactor. Interfacial areas and mass transfer coefficients are presented as a function of agitation rate. The direct application of this data to coal liquefaction awaits the procurement of similar data for other reactor types. This work is in progress and will be reported as it becomes available.

17923 **(FE—3397-8) Studies in coal liquefaction with application to the SRC and related processes. Quarterly report, August-October 1980.** Guin, J.A.; Tarrer, A.R. (Auburn Univ., AL (USA). Coal Conversion Lab.). 1980. Contract AC22-79ET13397. 73p. NTIS, PC A04/MF A01.

This work investigates the liquefaction of coal in several solvent mixtures. Model solvents composed of tetralin plus an added aliphatic or aromatic component of various molecular weights are employed. Liquefaction using tetralin plus a higher molecular weight cut derived from coal liquefaction is also examined. Kinetic rate constants including activation energies are obtained for conversion to cresol solubles in two of the model solvent systems. The coal liquefaction rate was found to be affected by the reactor volume, that is, the fraction of solvent vaporized at reaction conditions. Aliphatic components in the solvent tended to adversely affect liquefaction. Addition of a high molecular weight fraction from SRC processing to tetralin tended to enhance coal conversion to cresol solubles.

17924 **Reactor and method for hydrocracking carbonaceous material.** Beeson, J.L.; Dirksen, H.A.; Duncan, D.A.; Oberle, R.D. (to Department of Energy). US Patent 4,234,407. 18 Nov 1980. Filed date 26 Feb 1979. vp.

PAT-APPL-015257.

Solid, carbonaceous material is cracked in the presence of hydrogen or other reducing gas to provide aliphatic and aromatic hydrocarbons of lower molecular weight for gaseous and liquid fuels. The carbonaceous material, such as coal, is entrained as finely divided particles in a flow of reducing gas and preheated to near the decomposition temperature of the high molecular weight polymers. Within the reactor, small quantities of oxygen containing gas are injected at a plurality of discrete points to burn corresponding amounts of the hydrogen or other fuel and elevate the mixture to high temperatures sufficient to decompose the high molecular weight, carbonaceous solids. Turbulent mixing at each injection point rapidly quenches the material to a more moderate bulk temperature. Additional quenching after the final injection point can be performed by direct contact with quench gas or oil. The reactions are carried out in the presence of a hydrogen-containing reducing gas at moderate to high pressure which stabilizes the products.

17925 **(ORNL/MIT—328) Development of a packed-bed letdown valve for coal-liquefaction plants, Part 2.** Chuang, C.C.; Campbell, P.C.; Hamza, A.V. (Oak Ridge National Lab., TN (USA)). Apr 1981. Contract W-7405-ENG-26. 71p. NTIS, PC A04/MF A01.

Pressure-profile data were collected for single and multiphase (gas-liquid-solid) cocurrent upflow through a packed bed (2.5-cm diam, 1.84 m long) at high liquid and gas flow rates (0.027 and 0.3 m^3/min, respectively) and pressure drops (6.0 MPa). The behavior of the three-phase system was treated as a two-phase system, with the liquid viscosity modified to account for the presence of the solid phase. For gas and multiphase flow, the pressure drop per unit length of packing was a function of pressure, requiring numerical integration of Larkins' correlation to simulate column performance. The constants of Larkins' model were found by least-squares methods to be A = 0.107, B =0.157. The single-phase pressure drops were correlated using the Ergun equation. The constants obtained for this model for the liquid-phase data are α = 252, β = 0.88.

17926 **Cross-flow electrofilter and method.** Gidaspow, D.; Lee, C.H.; Wasan, D.T. (to Department of Energy). US Patent 4,224,135. 23 Sep 1980. Filed date 1 Nov 1978. vp. PAT-APPL-956709.

A filter for clarifying carbonaceous liquids containing finely divided solid particles of, for instance, unreacted coal, ash and other solids discharged from a coal liquefaction process is presented. The filter includes two passageways separated by a porous filter medium. In one preferred embodiment the filter medium is of tubular shape to form the first passageway and is enclosed within an outer housing to form the second passageway within the annulus. An electrode disposed in the first passageway , for instance along the tube axis, is connected to a source of high voltage for establishing an electric field between the electrode and the filter medium. Slurry feed flows through the first passageway tangentially to the surfaces of the filter medium and the electrode. Particles from the feed slurry are attracted to the electrode within the first passageway to prevent plugging of the porous filter medium while carbonaceous liquid filters into the second passageway for withdrawal. Concentrated slurry is discharged from the first passageway at an end opposite to the feed slurry inlet. Means are also provided for the addition of diluent and a surfactant into the slurry to control relative permittivity and the electrophoretic mobility of the particles.

17927 (P—300-81-002, pp 192-210) **Refining coal liquids: DOE's view.** Hildebrand, R. Jan 1981. California Energy Commission, Sacramento.

From Symposium on California and world oil: the strategic horizon; Los Angeles, CA, USA (17 Jul 1980).

The D.O.E. has embarked on an extensive program to convert coal to clean liquid fuels. The program seeks to define the capability of state-of-the-art refining technology to convert coal and oil shales to synthetic fuels, developing methods which are targeted to these materials. It also seeks to determine the relationship between refining severity and the toxicity and carcinogenicity of the products. The strategy is to initially use this synthetic petroleum as a boiler fuel allowing petroleum to be used as transportation fuels. Once the hydrogen content of synthetic fuels has been increased, conventional refining processes can be used. An economic comparison is made between petroleum and synfuel refining.

17928 (P—300-81-002, pp 211-224) **Refining synfuels.** Sullivan, R.F. Jan 1981. California Energy Commission, Sacramento.

From Symposium on California and world oil: the strategic horizon; Los Angeles, CA, USA (17 Jul 1980).

The objective of this work is to make transportation fuels from synthetic petroleum (synfuels), specifically coal liquids and shale oil. Advanced state-of-the-art petroleum processing technology is considered. Five different synthetic fuels were used in the study: Parahoe shale oil, SRC-I and SRC-II coal liquids, and 2 H-coal liquids. The refining steps are reviewed. A typical oil shale refinery is described. It is a petroleum refinery with the incorporation of hydrotreating facilities. Properties of fuels derived from synfuel refining are described and estimated costs are given. (DMC)

17929 **(UCRL-Trans—11685) Quality control in the Usiminas Coke Plant.** Fortes, M.; Machado, D. (Lawrence Livermore National Lab., CA (USA)). Mar 1981. Translation of Congress on the uses of coal in the iron and steel industry, Mexico City, Sponsored by ILAFA, Santiago, Chile, July, 1976 . 33p. NTIS, PC A03/MF A01.

This paper shows how the philosophy of quality control adopted at USIMINAS is implemented in the Coke Plant. For familiarity with it, the USIMINAS coking operation is briefly described at the outset. Then, because of the functions that the coke will perform in the blast furnaces, specification of it is shown. Next, all the quality control steps in the coking operation are analyzed, from the selection of the types of coal by means of linear programming, through preparation of the coal, control of the coke oven batteries, coking, etc., to preparation of coke size distribution, with reference to new trends in this control phase. Finally, the operational results in the USIMINAS blast furnaces are given. They reflect the effectiveness of this control process, the objectives sought being attained. Also, as an illustration, the results for 1974, when the quality of the coke was notably lower because of the coal-supply prices, are reviewed.

17930 **Process for hydrocracking carbonaceous material in liquid carrier.** Duncan, D.A. (to Department of Energy). US Patent 4,234,408. 18 Nov 1980. Filed date 13 Apr 1979. vp.

PAT-APPL-029963.

Solid carbonaceous material is hydrocracked to provide aliphatic and aromatic hydrocarbons for use as gaseous and liquid fuels or chemical feed stock. Particulate carbonaceous material such as coal in slurry with recycled product oil is preheated in liquid state to a temperature of 600°-1200° F. In the presence of hydrogen gas. The product oil acts as a sorbing agent for the agglomerating bitumens to minimize caking within the process. In the hydrocracking reactor, the slurry of oil and carbonaceous particles is heated within a tubular passageway to vaporize the oil and form a gas-solid mixture which is further heated to a hydropyrolysis temperature in excess of 1200° F. The gas-solid mixture is quenched by contact with additional oil to condense normally liquid hydrocarbons for separation from the gases. A fraction of the hydrocarbon liquid product is recycled for quenching and slurrying with the carbonaceous feed. Hydrogen is recovered from the gas for recycle and additional hydrogen is produced by gasification of residual char.

17931 **Process for hydrocracking carbonaceous material to provide fuels or chemical feed stock.** Duncan, D.A. (to Department of Energy). US Patent 4,225,414. 30 Sep 1980. Filed date 26 Feb 1979. vp.

PAT-APPL-15258.

A process is disclosed for hydrocracking coal or other carbonaceous material to produce various aromatic hydrocarbons including benzene, toluene, xylene, ethylbenzene, phenol and cresols in variable relative concentrations while maintaining a near constant maximum temperature. Variations in relative aromatic concentrations are achieved by changing the kinetic severity of the hydrocracking reaction by altering the temperature profile up to and quenching from the final hydrocracking temperature. The relative concentration of benzene to the alkyl and hydroxyl aromatics is increased by imposing increased kinetic severity above that corresponding to constant heating rate followed by immediate quenching at about the same rate to below the temperature at which dehydroxylation and dealkylation reactions appreciably occur. Similarly phenols, cresols and xylenes are produced in enhanced concentrations by adjusting the temperature profile to provide a reduced kinetic severity relative to that employed when high benzene concentrations are desired. These variations in concentrations can be used to produce desired materials for chemical feed stocks or for fuels.

0106 Properties

REFER ALSO TO CITATION(S) 17915, 17916, 17920, 17921, 17950, 18791, 18792, 18793, 18795, 19235

17932 (DOE/PC/30252—T3) Hydrogen bonding in asphaltenes and coal liquids. Quarterly report, 1 February-30 April 1981. Li, N.C.; Jones, L.; Yaggi, N.F. (Duquesne Univ., Pittsburgh, PA (USA). Dept. of Chemistry). 1981. Contract AC22-80PC30252. 30p. NTIS, PC A03/MF A01.

The objective of this project is to investigate the nature and strength of hydrogen bonding and other molecular interactions in coal liquids and their fractions. Determinations are made of the molecular interactions involving the preasphaltene, asphaltent and oil, together with their separated fractions, obtained from coal liquids after hydroprocessing under different processing conditions and accelerated aging. NMR, IR, GC/MS, calorimetric, GPC, ESR, viscosity methods are used to determine structural changes caused by upgrading and aging of coal liquids. The upgraded coal liquids, derived from catalytic hydroprocessing of a 30 to 70 weight percent blend of solid solvent refined coal product (SRC-I) with liquid solvent-refined coal product (SRC-II) were analyzed as a function of contact time and temperature, and the observed variations of structural parameters were correlated with the physical properties of the liquid products. The oxidative degradation of a SRC-II middle distillate, which is an oil, free of asphaltenes and benzene-insolubles, was investigated to determine the molecular types of compounds responsible for the viscosity change and postulate mechanisms. Since the middle distillate is relatively stable to oxidative degradation, copper shavings were added to accelerate the process. Results and discussion are presented in detail.

17933 (FE—2494-TR-2) Investigation of the distribution of minerals in coals by normative analysis. Given, P.H.; Weldon, D.; Suhr, N. (Pennsylvania State Univ., University Park (USA)). 1980. Contract AC22-76ET10587. 29p. NTIS, PC A03/MF A01.

The distribution of minerals in 86 coals have been calculated from chemical analyses of high temperature ash (normative analysis) and the results compared with mineralogical analyses based on x-ray diffraction and IR spectrometry of low temperature ash. Our general conclusion is that, to the extent we can determine at present, the normative analysis does give a useful semiquantitative analysis of the minerals in coals - better than one might predict from the nature of the procedure. It could be used, and will be in the near future, to ascertain whether, for example, the distributions of minerals in coals formed in different provinces and basins show gross differences as a result of differing geology and geochemistry. It might also be useful in assessing whether these differences are important in the conversion of coals to gaseous and liquid fuels. We should point out that we do not consider normative analysis at all applicable to lignites or subbituminous coals, since with lignites, 30 to 50% or more of ash-forming constituents consist of cations attached to the organic matter in ion-exchangeable form on carboxyl groups or as chelate complexes; a similar, though less marked, situation obtains with subbituminous coals.

0108 Waste Management

REFER ALSO TO CITATION(S) 17960, 19235

17934 (EPRI-CS—1744) Bench-scale study of the dry removal of SO_2 with nahcolite and trona. Final report. Muzio, L.J.; Arand, J.K. (KVB, Inc., Irvine, CA (USA)). Mar 1981. 106p. NTIS, PC A06/MF A01.

An experimental study was conducted to characterize a process designed to remove SO_2 by injecting a dry sodium-based sorbent into the flue gas stream ahead of a fabric filter baghouse. The experimental system consisted of a pulverized coal-fired combustor which fired a 0.45 percent sulfur western coal and produced a flue gas flow rate of about 2500 lb/hr (or about 800 acfm). The flue gas exited the combustor, flowed through a duct, then through a heat exchanger, and last through a fabric filter. The residence time in the duct between the combustor and fabric filter was approximately two seconds; the heat exchanger was used to independently control the temperature of the fabric filter. The dry sorbent could be injected either at the inlet to the fabric filter or into the duct before the heat exchanger. The experiments quantified the effects of the following process parameters on the dry SO_2 removal process: sorbent type (nahcolite, trona, commercial sodium bicarbonate), normalized stoichiometric ratio (NSR), sorbent particle size, baghouse temperature, air-to-cloth ratio, cleaning cycle time, sorbent injection schedule (continuous and batch), injection at temperatures up to 800°F, predecomposition of the nahcolite, and initial SO_2 level.

17935 Energy recovery system. Moore, A.S.; Verhoff, F.H. (to Department of Energy). US Patent 4,234,423. 18 Nov 1980. Filed date 30 Mar 1979. vp.

PAT-APPL-025639.

The present invention is directed to an improved wet air oxidation system and method for reducing the chemical oxygen demand (COD) of waste water from scrubbers of coal gasification plants, with this COD reduction being sufficient to effectively eliminate waste water as an environmental pollutant. The improvement of the present invention is provided by heating the air used in the oxidation process to a temperature substantially equal to the temperature in the oxidation reactor before compressing or pressurizing the air. The compression of the already hot air further heats the air which is then passed in heat exchange with gaseous products of the oxidation reaction for "superheating" the gaseous products prior to the use thereof in turbines as the driving fluid. The superheating of the gaseous products significantly minimizes condensation of gaseous products in the turbine so as to provide a substantially greater recovery of mechanical energy from the process than heretofore achieved.

17936 Catalytic iron oxide for lime regeneration in carbonaceous fuel combustion. Shen, M.; Yang, R.T. (to Department of Energy). US Patent 4,225,572. 30 Sep 1980. Filed date 29 Sep 1978. vp.

PAT-PPL-947664.

Lime utilization for sulfurous oxides absorption in fluidized combustion of carbonaceous fuels is improved by impregnation of porous lime particulates with iron oxide. The impregnation is achieved by spraying an aqueous solution of mixed iron sulfate and sulfite on the limestone before transfer to the fluidized bed combustor, whereby the iron compounds react with the limestone substrate to form iron oxide at the limestone surface. It is found that iron oxide present in the spent limestone acts as a catalyst to regenerate the spent limestone in a reducing environment. With only small quantities of iron oxide the calcium can be recycled at a significantly increased rate.

0109 Environmental Aspects

REFER ALSO TO CITATION(S) 17947, 17968, 18548, 18551, 18552, 18553, 18555, 18556, 18558, 18749, 18751, 19103, 19198, 19204, 19205, 19222, 19338, 19339, 19341, 19342, 19343, 19344, 19354, 19355, 19356, 19357, 19358, 19360, 19361, 19362

17937 (ANL/ECT-TM—4) Environmental-control considerations in the production and use of solvent-refined coal. Huang, H.S. (Argonne National Lab., IL (USA)). Dec 1980. Contract W-31-109-ENG-38. 102p. NTIS, PC A06/MF A01.

This report presents the results of an environmental-control study of the solvent-refined-coal (SRC) process. The report complements a previous Argonne report: Assessment of Status of Technology for Solvent Refining of Coal (ANL/ECT-3, Appendix B). The current review separates discussion of environmental control into two broad sections: production of SRC fuels, both solid and liquid, and their utilization. Control technologies are briefly reviewed for the gas, liquid, and solid wastes generated by the production of SRC. For an SRC-I plant, producing solid product, potential waste streams are then identified and discussed in terms of applicable control technologies and promulgated EPA standards. The SRC-production section concludes with a discussion of the biological activity of certain products of an SRC-II plant, producing liquid fuel. The author summarizes recent experimental findings and recommends accelerated research at SRC plants to quantify the effects of biological activity and develop measures needed to reduce those effects. No unusual environmental-control problems have been detected in the combustion of SRC fuels. It is recom-

mended, however, that more SRC combustion studies be made and that the solid and liquid fuels used in them be derived from a variety of parent coals. Such studies will establish the broad data base needed to demonstrate that SRC fuels burn efficiently within environmentally safe limits.

17938 **(DOE/PC/30117—T2) Instrumentation plan for characterization of subsidence over longwall mining panels at Allen Mine, Weston, Colorado.** O'Rourke, J. (Woodward-Clyde Consultants, San Francisco, CA (USA)). 1980. Contract AC22-80PC30117. 42p. NTIS, PC A03/MF A01.

The program includes surface, subsurface, and mine-level instrumentation to monitor subsidence characteristics over two adjacent longwall mining panels, situated in mountainous topography in southern Colorado. An installation plan has been detailed to show numbers and arrangements of instruments in and over the panels, and includes pertinent installation details. The appendix contains technical descriptions of standard features of some of the instrument systems, though in certain cases standard instruments will be modified by Woodward-Clyde Consultants (WCC) or the manufacturer to suit site specific installation requirements detailed on attached drawings. Technical discussions on the application of the instrument arrangements and data monitored to subsidence modeling are given in the report.

17939 **(EPA/600/7—79-217) Symposium proceedings: environmental aspects of fuel conversion technology, IV (April 1979, Hollywood, FL).** Ayer, F.A.; Jones, N.S. (comps.). (Research Triangle Inst., Research Triangle Park, NC (USA)). Sep 1979. 582p. (CONF-790449—). NTIS.

From EPA fuel conversion symposium; Hollywood, FL, USA (17 Apr 1979).

The proceedings document presentations made at the symposium on Environmental Aspects of Fuel Conversion Technology are presented. The symposium acted as a colloquium for discussion of environmentally related information on coal gasification and liquefaction. The program included sessions on program approach, environmental assessment, and control technology development. Process developers, process users, research scientists and state and federal government officials participated in this symposium, the fourth to be conducted by IERL-RTP on the subject since 1974. Separate abstracts have been prepared of individual presentations for inclusion in the Energy Data Base.

17940 **(NP—25378) Spoil bank energy forest systems. Final report to the Ozarks Regional Commission.** Naughton, G.G. (Kansas Energy Office, Topeka (USA); Kansas State Univ., Manhattan (USA). Dept. of Forestry). Apr 1981. 67p. NTIS, PC A04/MF A01.

The lands described in this study are located in Crawford and Cherokee Counties, Kansas, and were strip-mined for bituminous coal between 1877 and 1969. The approach to the problem was pragmatic. After defining and delineating the area of the study, a field reconnaissance and overview suggested that, within practical limits, the lands could be classified by current use and vegetation type. The most significant conclusion of this study is that reclamation projects undertaken on these lands should take full advantage of the fact that over 25% of the unreclaimed area is well stocked with native forest which can be reclaimed to economic productivity by providing access roads and trails to facilitate harvesting and management. The present timber quality on these lands is, on the average, too low to provide much lumber grade material. Primarily, these forests should be managed and harvested for production of fuelwood initially. Gradual conversion to sawtimber production will depend upon carefully selected and timed management operations over a period of 20 to 30 years. Even the most barren of the spoilbanks evaluated in this study show evidence of weathering to the extent that the surface shales are decomposing and the pyritic components are breaking down. This gradual process shows visible evidence that vegetation will encroach and become established as the natural weathering process continues. We concluded that, at least from the standpoint of afforestation, this natural weathering is advantageous to the early survival and establishment of transplanted tree seedlings. There is, at present, only a low level of interest among the landowners in the project area to reclaim their strip-mined lands by adopting our energy forest plantations prescriptions. However, owners of strip-mined lands which have been naturally forested are considerably more willing to consider the development of fuelwood management systems on their lands as a reclamation practice.

17941 **(P—700-79-010) SCE coal gasification demonstration project. Revised draft environmental impact report.** (California Energy Commission, Sacramento (USA)). Oct 1979. 349p. California Energy Commission, Sacramento.

Southern California Edison (SCE) has applied to the California Energy Commission (CEC) for a certificate to construct and operate an integrated coal gasification/combined cycle demonstration power plant. SCE proposes to test the facility for seven years beginning in 1983. The project will consist of a 1000 ton per day coal gasification system coupled with a new, approximately 100 MW (gross) combined cycle generating unit. This would be the largest gasifier in the United States, and the first integrated coal/gas combined cycle power plant. SCE plans to construct the project on their property at the Cool Water Generating Station. Cool Water is located in the Southern California Mojave Desert in northwest San Bernardino County, approximately 12 miles southeast of the City of Barstow and 120 miles northeast of Los Angeles. The purpose of this project is to demonstrate an integrated system for turning coal into a clean burning synthetic gas and to use that gas to generate electricity. The plant will generate electricity by burning the synthetic gas in a gas turbine which will drive an electric generator. An oxygen blown Texaco Coal Gasification process will make the fuel for the new power plant. There are three waste problems created by the project: solid, liquid, and gaseous. The project will create approximately 275,000 tons of slag over its life. SCE intends to dispose of the slag in a 12 acre area in the southeast corner of their property.

0110 Reserves And Exploration

17942 **(DOE/ET/14694—T4) Peat resource estimation in South Carolina. Second quarterly report (year 2).** (South Carolina Univ., Columbia (USA). Dept. of Geology). 1 Apr 1981. Contract FG01-79ET14694. 21p. NTIS, PC A02/MF A01.

The objectives of this program are to assess the magnitude of the resources and locate areas of highest potential for peat deposits in South Carolina. The energy potential of these peat resources is also being evaluated. This report presents the results of progress made during the last quarter in: assessing data and prioritizing peat areas to be surveyed; procurement of equipment and supplies; and preliminary peat resource assessment. A summary of the results of all new field surveys conducted during the quarter is included. Approximate locations of potential major peat deposits have been identified. Preliminary sampling studies indicate that Pigeon Bay may have the thickest and best quality peat in Berkeley County. Probes indicate peats up to 12 feet thick are located near the Black River in Georgetown County. Samples from areas designated as organic soils by the USDA were analyzed for moisture, organic, and ash content. (DMC)

17943 **Classification of coal resources and reserves.** van Rensburg, W.C.J. Austin, TX; University of Texas (1980). 39p. (NP—25380).

The debate on the problem of the adequacy of non-renewable rsources is circumscribed by the sheer difficulty of measuring the quantities of minerals available and those awaiting discovery. This is not simply the comparatively easy problem of assessing the quantities of coal in known deposits, nor the much more difficult problem of assessing the quantities of coal yet to be found. It is the problem of defining agreed constraints on coal yet to be found. There can be no absolute figure for the reserves of any particular mineral because estimates of mineral supplies are dynamic and change with the discovery of new deposits, with the depletion of deposits being exploited, and with economic, technological, and environmental factors. Regional or national reserve estimates are derived by adding together data on many individual deposits and, therefore, reflect many different assumptions and varying degrees of accuracy. Another major difficulty is the unavailability and incompatibility of data from various sources. Most of the information on US coal resources is in private company files. Few of these

companies would be willing to release such information, which they regard as proprietary. The degree of certainty with which these reserves are known is questionable, and the recovery factor of 50% for underground mining is too high. Even if we accept the USGS estimate of 220 billion tons, this estimated should be seen in the perspective of future demand for coal, including requirements for synthetic fuels and a substantial expansion of our coal-fired electricity-generating capacity. Excessive optimism about the extent of our coal reserves is unwarranted, and a viable long-term energy policy requires a much more accurate picture of United States coal reserves. It would be fatal to make the same mistake of over-optimism about our coal reserves as we made with crude oil reserves.

17944 **(USGS-OFR—80-852) Geophysical and lithologic logs of nine test holes drilled during 1978 in Harding County, South Dakota.** Kistner, F.B. (Geological Survey, Washington, DC (USA)). 1980. 22p. Geological Survey, Washington, DC.

Between October 25 and November 1, 1978, nine coal test holes were drilled and geophysically logged near Ludlow, in Harding County, South Dakota. Drilling was conducted by personnel (and drilling equipment) of the US Geological Survey (USGS) as part of an ongoing USGS program to evaluate and classify mineral lands in the public domain. The purpose of the program is to gather data on the thickness, extent, correlation, quality, and recoverability of coal beds, and the thickness and lithologic characteristics of the associated rocks in the Tertiary Tongue River and Ludlow-Cannonball Members of the Fort Union Formation in the Williston Basin. This report presents geophysical logs and field lithologic descriptions lagged (or corrected in depth intervals) to match the geophysical logs.

17945 **Lignite resources in Texas.** Kaiser, W.R.; Ayers, W.B. Jr.; LaBrie, L.W. Austin, TX; University of Texas (1980). 55p. (NP—25364).

Texas lignite occurs in three Eocene (lower Tertiary) geologic units - the Wilcox Group, Jackson Group, and Yegua Formation - and in three ancient depositional systems - fluvial, deltaic, and strandplain/lagoonal. Near-surface resources in Texas at depths between 20 and 200 ft (6.1 and 61 m) in seams 3 ft (0.9 m) or thicker are 23,377 million short tons (21,208 million metric tons) and are dominantly fluvial in origin. More than 90 percent of the resources occur in the Wilcox and Jackson Groups north of the Colorado River. The size of individual deposits ranges from 50 to 500 million tons (45 to 450 million metric tons). The average seam thickness is less than 5 ft (1.5 m); a 10-ft (3.0-m) seam is exceptional. Depending on mining depth, reserves are estimated to be 8635 to 11,102 million tons (7834 to 10,072 million metric tons). Deep-basin resources at depths between 200 and 2000 ft (61 and 610 m) in seams 5 ft (1.5 m) or thicker are 34,819 million tons (31,588 million metric tons), 70 and 30 percent being in the Wilcox and Jackson Groups, respectively. Approximately 2.4 million acres (1.0 million ha) are leased for lignite; 84, 12, and 4 percent of the acreage is in the Wilcox, Jackson, and Yegua, respectively. Wilcox lignite is the best grade. Yegua is intermediate, and Jackson is the poorest grade lignite in Texas. Typical Wilcox lignite has a heating value of 6500 Btu/lb (3612 kcal/kg) and a 33-percent moisture, 1-percent sulfur, and 15-percent ash content. Lignite reserves are adequate to meet the projected needs (6 to 7 billion short tons [5.4 to 6.3 billion metric tons]) of the electric utility and industrial sectors into the next century. Most of the lignite will continue to be used to generate electric power; however, lignite will be used in the future to produce synthetic fuels and chemicals.

17946 **Peat as an energy alternative: an overview.** Punwani, D.V. Chicago, IL; Institute of Gas Technology (1980). 28p. (CONF-801252—2).

From IGT symposium on peat as an energy alternative; Arlington, VA, USA (1 Dec 1980).

Peat is a worldwide resource that is used commercially in Ireland, Finland, and the USSR as a source of energy. While these countries plan to increase their use of peat for energy, plans to develop peat as an energy alternative are underway in many other countries. At present, peat is used commercially for energy only as boiler-feed to produce steam for electric power generation and district heating. The results of recent research show that peat is an excellent raw maerial for making synthetic fuels. Therefore the objective of most of the recent efforts in various countries is to produce synthetic fuels from peat. This paper presents an overview of peat geology, varieties, world resources, and the technologies for peat harvesting, dewatering, and utilization for energy and environmental considerations.

0120 Mining

REFER ALSO TO CITATION(S) 18514

17947 **(BM-TPR—113) Convergence measurements for squeeze monitoring: instrumentation and results. Bureau of Mines technical progress report 113.** Bauer, E.R.; Chekan, G.J. (Pennsylvania Univ., Philadelphia (USA). National Center for Energy Management and Power). Mar 1981. 11p. Bureau of Mines, Washington, DC.

Squeezing in coal mines results from a slow increase in weight on pillars or solid coal. The usual cause of such a weight increase is pillars or other support that have become inadequate after a considerable area has been opened up by mining. The inadequate support permits the roof to gradually settle, and the settling is accompanied by such events as crushing of the coal, heaving of the floor, the driving of pillars into a soft floor or roof, and even total roof-to-floor closure. To insure maximum worker safety, the unsafe work environment resulting from a squeeze must be thoroughly defined. The Bureau undertook this investigation as part of its ongoing research in mine health and safety. The objective was to monitor a squeeze, utilizing roof-to-floor convergence measurements. The magnitude and rate of advance of an inmine coal squeeze was determined by measuring roof-to-floor convergence on a regular basis. A dial-gage tube extensometer was used to collect data. Using these measurements, Bureau of Mines employees drew contour maps and graphs to show the direction and rate of squeezing. Information on the rate of squeeze advance was used to determine whether steps should be taken to prevent roof and/or floor movement from closing an entire section of the mine and if alteration of mining plans was necessary to prevent further squeeze development. Data analysis revealed that the squeeze was decelerating; thus there was no need to strengthen support in the areas of the mine that were studied. Mining plans were altered, however, as a result of the findings of this investigation.

17948 (CONF-800483—(Vol.2), pp 695-699) **Improved dragline utilization.** Keller, K.J. (McDonnell Douglas Electronics Co., St. Charles, MO). 1980. NTIS, PC A19/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

The cause of energy conservation can be served by increasing the efficiency of large draglines used in surface coal mining. The topic is the application of a training simulator, computer instrumentation, and computer simulation to improve dragline operator skill, decrease downtime, and optimize the digging strategy of the machine. The training simulator is a TV-model system, which the trainee controls from a simulated cab. Dragline instrumentation is achieved by a computer, a control/display console for the operator and sensors mounted throughout the dragline. The dragline-simulation model is a computer program to determine production as a function of overburden properties, dragline specifications, and removal strategy. The simulation model used in conjunction with the recorded data from the on-board system provides a basis for the evaluation and optimization of dragline operating procedures. The dragline simulator, display and recording system, and simulation model were initially developed under contract with the Department of Energy.

17949 **(DOE/ET/14257—T1) High-angle-mining system. Task report: definition of system requirements.** Brown, E.G. (FMC Corp., Santa Clara, CA (USA). Engineered Systems Div.). Dec 1980. Contract AC01-80ET14257. 58p. NTIS, PC A04/MF A01.

The commonly accepted limits for conventional highwall coal augering are seam thickness from 2 to 8 ft, a pitch less than 10°, and a penetration depth of 150 to 200 ft. Recovery ratios for these conditions vary from 25 to 50%. One source found, for a lim-

ited sample base, an average recovery ratio of about 35%. The factors contributing to recovery losses were noted to be the following: Undersize augers for the seam being mined, hole depths less than maximum obtainable, and excessive spacing between holes. An attempt was made to determine the reserves available for auger mining by reviewing the literature. The augerable reserve base for horizontal seams (0 to 10°) between seam limits of 2 to 8 ft for a penetration depth of 200 ft has been estimated at 5 billion tons. An equivalent value estimated for coal residing in steeply pitching seams (25 to 90°) is 234 million tons for a penetration depth of 150 ft (or 312 million tons for 200 ft). While no similar value for moderately pitching seams (10 to 25°) has been found, most of the information necessary to make such an estimate exists. Recovery ratio, hole size, and spacing, to a large extent, depend on geological factors affecting highwall face integrity and coal competency. The thicker the seam, the more difficult it becomes to achieve high recovery. Narrow and high-ceilinged excavations, coupled with small face openings, appear feasible in competent coal and may be the most promising approach to improve recovery. Another approach to improve recovery is to structurally fill the excavation with a water, crushed rock, and limestone mixture. The cost of this must be weighed against the additional amount of coal recoverable.

0130 Transport And Handling

REFER ALSO TO CITATION(S) 18751

17950 **(CONF-7810191—) Proceedings of the coal and coke sessions.** Hancock, H.A. (ed.). (Canadian Society for Chemical Engineering, Ottawa). 1978. 180p. NTIS (US Sales Only), PC A09/MF A01.

From 28. Canadian chemical engineering conference; Halifax, Canada (22 Oct 1978).

The 28th Canadian Chemical Engineering Conference coal and coke sessions was held at Halifax, Nova Scotia, October 22-25, 1978. The papers deal mainly with coal preparation, pyrolysis and carbonization with isolated papers on petrochemical feed stocks, ash disposal, coal information, recovery of metals from fly ash, thermal analysis, desulfurization, devolatilization, chemical comminution and deashing of coal liquids. Fifteen papers, from the proceedings have been entered individually into EDB and ERA. (LTN)

17951 **(DOE/ET/10559—T1) Effects of minerals on coal-benefication processes. Quarterly report No. 11, July 1-September 19, 1980.** McMillan, B.G.; Muter, R.B.; Grady, W.C. (West Virginia Univ., Morgantown (USA). Coal Research Bureau). 15 Dec 1980. Contract AC22-77ET10559. 41p. NTIS, PC A03/MF A01.

With the issuance of this report, all tasks and primary objectives of the contract have been addressed and completed, with the exception of the final report preparation, which is currently ongoing. This study has attempted to examine that which complicates all phases of coal utilization, i.e., the contained minerals within the coal and the effect of coal cleaning on their distribution. Three nationally important and regionally different bituminous coals - the Pittsburgh seam, the Pocahontas No. 3 seam, and the Illinois No. 6 seam - have been studied during the course of the work, and a discussion of the final data acquisition, some of the findings, and data revisions are presented in this document. Primary emphasis was on the mineral distributions and their concurrent actions. To study this, mineral washability diagrams, mineral separabilities and other data graphics were prepared to assist in interpreting the relationships. As part of the finalization of data acquisition, a complete petrographic analysis of macerals and submacerals for the Illinois No. 6 coal was also performed. Methods and data presentation used are similar to that previously employed to allow comparisons of these three sets of coal samples.

17952 **(DOE/ET/10559—T2) Effects of minerals on coal-beneficiation processes. Quarterly report No. 10, January 1-March 31, 1980.** McMillan, B.G.; Muter, R.B.; Buttermore, W.H.; Grady, W.C.; Alderman, J.K.; Durham, D.L. (West Virginia Univ., Morgantown (USA). Coal Research Bureau). 15 Oct 1980. Contract AC22-77ET10559. 19p. NTIS, PC A02/MF A01.

All basic data acquisition relevant to characterization of the contract samples physically and chemically has been completed. Assessment of this data and inter-relationships with mineralogical characterization data is concurrently on-going, with final petrographic data acquisition for the contract to be affected during the next quarter. This remaining analytical work is the detailed maceral analysis of the Illinois No. 6 samples. Work during this quarter focused on coarse and fine coal heavy-media pilot-scale cleaning operations using a heavy-media drum separation and a heavy-media cyclone. Chemical and mineralogical effects produced by these tests are reported herein, completing Task 4 testing of the effects of laboratory pilot cleaning on mineral composition and distribution. Results for froth flotation, size by gravity, jigging, and tabling for this task have been previously reported. Also completed during the work period was the chemical characterization of the Illinois No. 6 slurry-fines sample. Mineralogical data for this sample were reported in Progress Report Number 9.

17953 **(DOE/ET/10559—T3) Effects of minerals on coal-benefication processes. Quarterly report No. 9, October 1-December 31, 1979.** McMillan, B.G.; Muter, R.B.; Buttermore, W.H.; Grady, W.C.; Alderman, J.K.; Durham, D. (West Virginia Univ., Morgantown (USA). Coal Research Bureau). 15 Sep 1980. Contract AC22-77ET10559. 42p. NTIS, PC A03/MF A01.

Unit operation pilot scale tests have been completed for froth flotation, tabling and jigging cleaning operations. An assessment and chemical/mineralogical data for these tests are reported herein. Tests for the heavy media cyclone and WEMCO HMS unit are on-going and will be reported in the next quarter. Also completed during the report period was an in-depth petrographic analysis of the Pocahontas No. 3 coal. Coal macerals by size and gravity were determined as volume percent of the whole coal and are contained in this report. This leaves only the Illinois No. 6 samples for detailed maceral analysis vs. screen/gravity fractions. Accumulation of XRPD data for coal minerals with Pocahontas No. 3 was continued based on the methodology presented in Quarterly Report No. 8. Standardization equations were developed for the Pocahontas No. 3 and Illinois No. 6 samples and mineralogical trends for these coals and the Pittsburgh seam samples were determined. Some generalizations are possible which should aid in interpreting the preparation plant and pilot plant cleaning of these coals. Illite and quartz constitute the majority of all LTA's whether of cleaned coals or refuse. Some minerals display the proprty of being highly separated into either the cleaned coal or the refuse, especially when fine coal sizes are cleaned. Calcite and kaolinite are prime examples in that kaolinite is greatest in the LTA's of the cleaned coal, and calcite is greatest in the LTA's of the refuse. Minerals such as apatite and siderite are most effectively separated into the cleaned coal and refuse only when large coal sizes are cleaned.

17954 **(DOE/MC/14266—T3) Coal materials handling: classifier evaluation. Quarterly progress report, October-December 1980.** Rogers, R.S.C. (Kennedy Van Saun Corp., Danville, PA (USA)). 1980. Contract AC21-80MC14266. 177p. NTIS, PC A09/MF A01.

The desire and need to reduce energy requirements is, of course, the first and foremost reason for seeking a better understanding of the role of classification in closed circuit coal grinding. A better understanding of classifiers typically used in conjunction with coal grinding circuits would result in the ability to better utilize energies expended in coal grinding. In addition, the ability to better control the product size distribution is of major importance to many new processes being introduced to our energy conscious economy. Such processes include coal-oil mixture production, the production of coal-water slurries of pipelines, coal gasification and the production of solvent refined coal. All of these processes call for the use of pumpable and high concentrate slurries. In all cases the particle size distribution has a direct effect on the pumpability and percent by weight solids concentration that is reasonably attainable. Recognizing the need for a better technical understanding of classifiers used in coal grinding, the United States Department of Energy and the Kennedy Van Saun Corporation conceived the present project to evaluate various classifiers currently being used in air swept coal grinding systems. The classifiers under consideration include a twin cone classifier, an expansion chamber type (varimesh) classifier and a new centrifugal classifier recently introduced

by Hukki. The objectives of this evaluation are to compare the classifiers with respect to their effect on closed circuit grinding system performance and to provide data that will allow a preliminary evaluation of classifier design with respect to separation on the basis of sulfur and ash content.

17955 **(DOE/MC/14602—3) Development of a pilot-scale kinetic extruder feeder system and test program. 1st quarterly technical progress report, October-December 1980.** (Lockheed Missiles and Space Co., Sunnyvale, CA (USA)). 15 Jan 1981. Contract AC21-80MC14602. 16p. (LMSC-D—767503). NTIS, PC A02/MF A01.

Preparations are being made to ready the equipment for the test program. The main effort described in this report pertains to the redesign of the main shaft bearing and seal system.

17956 **(DOE/PC/30234—T1) Microgas dispersion for fine-coal cleaning. Technical progress report, September 1, 1980-February 28, 1981.** Yoon, R.H.; Sebba, F. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA)). 1980. Contract FG22-80PC30234. 23p. NTIS, PC A02/MF A01.

The purpose of this project is to develop a method of cleaning fine coal by flotation using very small microbubbles now known as Colloidal Gas Aphrons (CGA) and previously known as Microgas Dispersions (MGD). It was thought that MGD was not sufficiently descriptive of the nature of the small bubbles, and hence, the change was made. The objectives of the past six months of investigation were as follows: (1) a fundamental study of the properties of CGA, which involved (i) a study of the stability of the bubbles generated with several frothers that are currently used in the mineral industry, (ii) a study of the charge on the bubbles, and (iii) a microscopic inspection of the bubbles during flotation; (2) a preliminary investigation of the flotation characteristics of coal; and (3) construction of an automatic batch flotation machine, similar to the one described by Miller (1980).

17957 **Process for changing caking coals to noncaking coals.** Beeson, J.L. (to Department of Energy). US Patent 4,234,319. 18 Nov 1980. Filed date 25 Apr 1979. vp.

PAT-APPL-033076.

Caking coals are treated in a slurry including alkaline earth metal hydroxides at moderate pressures and temperatures in air to form noncaking carbonaceous material. Hydroxides such as calcium hydroxide, magnesium hydroxide or barium hydroxide are contemplated for slurrying with the coal to interact with the agglomerating constituents. The slurry is subsequently dewatered and dried in air at atmospheric pressure to produce a nonagglomerating carbonaceous material that can be conveniently handled in various coal conversion and combustion processes.

17958 **Wet carbonization of peat: state-of-the-art review.** Mensinger, M.C. Chicago, IL; IIT Center (1980). 31p. (CONF-801252—1).

From IGT symposium on peat as an energy alternative; Arlington, VA, USA (1 Dec 1980).

Peat, in its naturally occurring state, contains as much as 90 weight percent water. To use peat as a source of energy, the bulk of this water must be removed in an energy-efficient manner using either mechanical methods or solar energy, without the use of fossil fuel. Solar drying is an energy-efficient method, but its success is heavily weather dependent. Mechanical dewatering (pressing) methods, similar to those used for dewatering sludge and paper pulp, can reduce the peat moisture content to the range of 70 to 75%. However, thermal drying is required to achieve lower moisture content. One of the pretreatment methods that facilitates the mechanical dewatering of peat to 50 weight percent moisture is wet carbonization. In this process, wet peat is heated under pressure to temperatures in the range of 300 to 1000°F from 5 to 60 minutes of residence time. Wet carbonization of the peat also removes a fraction of the oxygen from the peat by decarboxylation and dehydratization reactions. Wet-carbonized peat can be readily dewatered to less than 50 weight percent moisture. This paper reviews the development and state-of-the-art of wet-carbonization processes beginning with M. Ekenberg's process in England and Scotland in the early 20th century to those of others in Sweden, the USSR, Germany, and more recently, Finland and the United States.

17959 **(DOE/PC/30212—T1) Venturi design for metering solids flow in gas-solids suspentions.** Crowe, C.T. (Washington State Univ., Pullman (USA). Dept. of Mechanical Engineering). [nd]. Contract FG22-80PC30212. 11p. NTIS, PC A02/MF A01.

Objective is to study the use of the venturi to meter gas-solids at larger particle size the modifying the inlet geometry and using a laser-light attenuation system at the venturi throat. Three tasks are reported: (1) study of influence of venturi approach angle on meter sensitivity to solids loading; (2) use of a quasi one-dimensional numerical model to optimize the inlet geometry for limestone transport to a fluidized bed; and (3) study adequacy of annular venturi and a gas-solids flowmeter. (DLC)

0140 Combustion

REFER ALSO TO CITATION(S) 18536, 18959, 19051, 19084, 19099, 19101

17960 **(DOE/METC/RI—128) Evaluation of the sulfur sorption properties of chemically improved limestones during fluidized-bed combustion.** Grimm, U. (Department of Energy, Morgantown, WV (USA). Morgantown Energy Technology Center). Mar 1981. 84p. NTIS, PC A05/MF A01.

A program was initiated in early 1980 at the Morgantown Energy Technology Center, Department of Energy, to evaluate the sulfur retention capability of a number of chemically improved limestones. These synthetic sorbents were developed by the University of Tennessee under an agreement with the Tennessee Valley Authority. Fredonia limestone and Shawnee hopper ash, in combination with a binder, are the main ingredients of the artificial sorbents. The manufacturing process of these pellets is described elsewhere. The effectiveness of the sorbents in sulfur emission controls and their calcium utilization potential were originally controlled by a rapid TG method displayed by the University of Tennessee. Performance data in real fluidizing combustion processes were missing. In a cooperative effort between the Morgantown Energy Technology Center and the Energy Research Division of TVA, an agreement was reached to test four new sorbents, a power station fly ash, and Fredonia limestone at the Morgantown 6-Inch Diameter AFBC Facility. The results generated in the fluidized-combustion test confirmed the findings by the University of Tennessee and the test program was determined to be highly successful. Details of the program as well as the results are presented in this report.

17961 **(DOE/PC/30301—2) CaO interactions in the staged combustion of coal. Second quarterly technical progress report, January 1, 1981-March 31, 1981.** Levy, A.; Merryman, E.L. (Battelle Columbus Labs., OH (USA)). 30 Apr 1981. Contract AC22-80PC30301. 20p. NTIS, PC A02/MF A01.

The CaO-FeS_2 reaction was studied as a function of temperature, reaction time, Ca/S mole ratio and particle size. All reactions were carried out under a nitrogen environment. The reactions were followed principally in terms of weight loss and SO_2 emissions. The decomposition of the pyrite produces S_2 which reacts with CaO to produce SO_2 and CaS. The extent of the reaction appears to increase monotonically between 555 and 970°C.

17962 **(DOE/TIC—11440) Coal and ash blend analysis of a bituminous and a subbituminous coal.** Bruns, J.M.B. (Ames Lab., IA (USA)). Feb 1981. Contract W-7405-ENG-82. 252p. NTIS, PC A12/MF A01.

Thesis.

Coal blending is a readily available and very economical means of improving the quality of coals for combustion. With blending, Midwestern coals can be used to burn low BTU Western subbituminous coals efficiently and this can eliminate, or reduce the need for, flue gas desulfurizaton systems. Blending allows coal heating values to be more closely controlled and avoids the effects of major fluctuations in heat generation. Experience has shown that regulation of the BTU value will cause all other coal specifications to fall within designated limits. These specifications include: minimum heating value, maximum volatile matter, maximum ash, maximum moisture, maximum alkalis, maximum grindability, and mini-

mum ash fusion temperatures. Blending will offer other benefits to coal-fired power generating plants. The capital cost of boilers can be reduced if variations in the fuel properties can be reduced. If the heating value is kept constant, the required boiler size will be better estimated and can be smaller. Boiler slagging and fouling could be reduced if coals of uniform heating value are used. To be successful, blending requires a careful selection of coals. This study has been undertaken in an attempt to derive better blending principles to provide maximum heating with minimum emissions, fouling, and slagging. The properties of a Western subbituminous coal and a Midwestern bituminous coal are studied in detail. The coals are then blended in selected proportions and their mineral contents studied in detail. Finally, fusion behavior of the blends is observed and the ash components identified. In this way combustion problems which could result from a carbon or random selection of coals to be blended can be minimized.

17963 **(FE—3269-36) Design, construction, operation and evaluation of a Prototype Culm Combustion Boiler/Heater Unit. Quarterly technical progress report, July 1-September 30, 1980.** (Curtiss-Wright Corp., Wood-Ridge, NJ (USA). Power Systems Div.). Jan 1981. Contract AC21-78ET12307. 40p. (CW-WR—78-036.36A). NTIS, PC A03/MF A01.

This report provides a summary of the work performed on the Prototype Culm Combustion Boiler/Heater Unit, Phase I - Engineering Design and Analysis and Phase II - Prototype Plant Construction during the period July 1, 1980, through September 30, 1980. The objectives of the program as well as the technical progress and problem areas encountered are presented. The final detail design effort was completed. Progress on procurement activity authorized by full Phase II release on March 20, 1980, is discussed. The construction bid package was completed, approved by DOE and issued for quotation. Construction quotations were received and bids tabulated resulting in the selection and recommendation to DOE of a construction contractor. F.W. George, subcontractor to E. Keeler Co. for boiler erection, has begun erection of the boiler supporting structure.

17964 **Investigations of ash fouling mechanisms for western coals using microscopic and x-ray diffraction techniques.** Rindt, D.K.; Selle, S.J.; Beckering, W. (Grand Forks Energy Technol Cent, ND). *American Society of Mechanical Engineers, [Paper]* ; No. 79-WA/CD-5, vp(2 Dec 1979).

Investigations at Grand Forks Energy Technology Center (GFETC) of lignitic fireside ash deposits have led to advancements in the understanding of ash fouling mechanisms and in selecting potential additives for fouling control. Studies of ash deposit particles are being pursued utilizing a heating stage microscope, polarizing light microscope, scanning and analyzing electron microscope, and a powder X-ray diffractometer. Analysis of individual ash deposit particles has shown the existence of a film of Na_2SO_4 on essentially all particles analyzed. 11 refs.

0150 Marketing And Economics

REFER ALSO TO CITATION(S) 18751

17965 **(DOE/EIA—0217(80)) Coal distribution companies in the United States, 1980.** McNair, M. (USDOE Energy Information Administration, Washington, DC. Office of Coal and Electric Power Statistics). 8 Apr 1981. 104p. NTIS, PC A06/MF A01.

This list of coal distribution companies has been compiled by the Coal Statistics Division, Office of Coal and Electric Power Statistics, Energy Information Administration, (EIA), Department of Energy, for the purpose of identifying organizations in the United States that submitted coal distribution data directly to EIA on Form EIA 6, Coal Distribution Report. The term Coal Distribution Companies includes coal mining companies, wholesale coal dealers (including brokers), and retail coal dealers. The coal distribution companies are arranged in alphabetical order with an identification of the coal producing district(s) that each company served in 1980.

17966 **Proceedings of Rocky Mountain Coal Mining Institute 76th regular meeting, Vail, Colorado, June 29-July 2, 1980.** Vail, CO; Rocky Mountain Coal Mining Institute (1980). 133p.

From 76. regular meeting of the Rocky Mountain Coal Mining Institute; Vail, CO, USA (29 Jun 1980).

The 76th regular meeting of the Rocky Mountain Coal Mining Institute was held June 29-July 2, 1980, at Lionshead Village, Vail, Colorado. Five paprs have been entered individually into EDB. (LTN)

17967 **Future of steam coal.** Reddington, J. pp 407-418 of International energy strategies. Dunkerley, J. (ed.). Cambridge, MA; Oelgeschlager, Gunn & Hain, Publishers, Inc. (1980).

From IAEE/RFF international energy strategies conference; Washington, DC, USA (4 Jun 1979).

We (IEA, OECD) have concluded that higher oil prices have indeed transformed the economics of coal usage, and even under the assumption that many would judge to be a modest increase in price of oil after 1985, we found in all cases that the long-term cost of using coal was lower than for fuel oil and that in many instances it was probably lower than for nuclear, although the second conclusion would be determined by the site-specific conditions of the power plant or industrial user. Some nuclear enthusiasts suspected that we had tilted our cost estimates in favor of coal. It is true that we assume that the real price of coal will advance in the average only 1 percent per annum as contrasted with 2.5 percent for crude oil, but this is based on a flat supply cost curve for new, surfaced-mined coal and on the abundant, widely dispersed world coal deposits. We are also optimistic on reduction of ocean transport costs once world trade enlarges greatly. We have also tilted against coal in our fuel-costing comparison by making a more elaborate analysis of the cost of environmental measures for coal than for the other fuels. This full cost analysis including the environmental cost computed to the producer and user would allow the satisfaction of at least the demand for coal that we foresee. Indeed, we suspect that the potential demand may be greater if all the required infrastructure could be put in place by 2000. Recent events have only increased our confidence in the demand for coal, and we may see conventional wisdom saying coal is not demand constrained but supply constrained, because of restrictive leasing policies or inadequate infrastructure, e.g. port facilities.

0160 Health And Safety

REFER ALSO TO CITATION(S) 17937, 19188, 19189, 19190, 19191, 19192, 19193, 19348, 19349, 19350, 19351, 19353

17968 (EPA/600/7—79-217, pp 357-382) **Environmental assessment of SRC-II: an update.** Moxley, C.R. (Gulf Mineral Resources Co., Denver, CO); Schmalzer, D.K. Sep 1979. NTIS.

From EPA fuel conversion symposium; Hollywood, FL, USA (17 Apr 1979).

This paper describes the activities that have been undertaken, as well as future environmental activities that will occur in the succeeding phases of the 6000 T/D SRC-II Coal Liquefaction Demonstration Project. This plant will be built in the Morgantown, West Virginia area under sponsorship of the US Department of Energy (DOE). Currently, the phase is characterized by efforts in two main areas: (1) collection of baseline data for incorporation into an environmental impact statement. A brief description of our data-gathering effort is given with special attention to; (a) results from the air-monitoring station, especially regarding the ozone attainment/nonattainment status in the area; (b) existing levels of PNAs in soils, ambient suspended particulate matter, groundwaters, and surface waters/sediments in the Monongahela River and the various tributaries that traverse the project site; and (c) expected impact of the project on the existing socioeconomic climate of the region. (2) Identification of the following anticipated major environmental concerns of the project: (a) current plans for the onsite disposal of approximately 800 T/D of a potentially hazardous waste; (b) medical surveillance program for plant workers and the status of the toxicology programs for SRC-II (solvent refined coal) products and intermediate streams; (c) consumptive use of water

and its impact on the Monongahela River; and (c) status of combustion tests on SRC-II product oil and anticipated environmental concerns of its use.

0170 Legislation And Regulations

REFER ALSO TO CITATION(S) 18750

02 PETROLEUM

REFER ALSO TO CITATION(S) 18742

0201 Reserves

17969 **(DOE/ET/44614—T4) Depositional systems and hydrocarbon resource potential of the Pennsylvanian system, Palo Duro and Dalhart Basins, Testas Panhandle. Geological Circular 80-8.** Dutton, S.P. (Texas Univ., Austin (USA). Bureau of Economic Geology). 1980. Contract AC97-79ET44614. 55p. NTIS, PC A04/MF A01.

Pennsylvanian clastic and carbonate strata were deposited in a variety of environments within the Palo Duro Basin. Maximum accumulation (totalling 750 m or 2400 ft) occurred along a northwest-southeast axis. Major facies include fan-delta sandstone and conglomerate, shelf and shelf-margin carbonate, deltaic sandstone and shale, and basinal shale and fine-grained sandstone. Erosion of Precambrian basement in the adjacent Amarillo and Sierra Grande Uplifts supplied arkosic sand (granite wash) to fan deltas along the northern margin of the basin. Distal fan-delta sandstones grade laterally and basinward into shallow-shelf limestone. Deep basinal shales were deposited only in a small area immediately north of the Matador Arch. Increased subsidence deepened and enlarged the basin throughout late Pennsylvanian time. Ultimately, the basin axis trended east-west with a narrow northwest extension. A carbonate shelf-margin complex having 60 to 120 m (200 to 400 ft) of depositional relief developed around the basin margin. The eastern shelf margin remained stationary, but the western shelf margin retreated landward throughout late Pennsylvanian time. Porous, dolomitized limestone occurs in a belt 16 to 32 km (10 to 20 mi) wide along the shelf margin. High-constructive elongate deltas prograded into the Palo Duro Basin from the east during late Pennsylvanian time. Prodelta mud and thin turbidite sands entered the basin through breaks in the eastern carbonate shelf margin. Potential hydrocarbon reservoirs re shelf-margin dolomite, fan-delta sandstone, and high-constructive delta sandstone. Basinal shales are fair to good hydrocarbon source rocks on the basis of total organic carbon content. Kerogen color and vitrinite reflectance data indicate that source beds may have reached the early stages of hydrocarbon maturation.

17970 **(USGS-OFR—80-1042) Estimated oil and gas reserves, Southern California Outer Continental Shelf, December 31, 1979.** Kalil, F.F. (Geological Survey, Washington, DC (USA)). 1980. 10p. Geological Survey, Washington, DC.

Remaining recoverable reserves of oil and gas in the Outer Continental Shelf off Southern California are estimated at approximately 730 million barrels of oil and about 1750 billion cubic feet of gas, as of December 31, 1979. Only two of the 13 known fields are on production at the present time and none is completely developed. Original recoverable reserves of these fields are estimated to have been about 920 million barrels of oil and aproximately 1845 billion cubic feet of gas. These estimates for both the remaining and the original recoverable reserves are higher than the corresponding December 31, 1978 estimates, which were for 14 then-known fields. Reserve estimates for 11 fields were based on individual volumetric reservoir studies. Decline curve and volumetric analysis were used to estimate the reserves in the remaining two fields. The estimates of original and remaining recoverable reserves are reported as one total for oil and one total for gas within the Southern California Outer Continental Shelf.

0202 Geology And Exploration

REFER ALSO TO CITATION(S) 19390

17971 **(DOE/ET/12130—T13) Occurrence of oil and gas in Devonian shales and equivalents in West Virginia. Final report.** Schwietering, J.F. (West Virginia Geological and Economic Survey, Morgantown (USA)). Mar 1981. Contract AC21-76ET12130. 44p. NTIS, PC A03/MF A01.

Three facies are recognized in the Catskill clastic wedge: (1) a red bed facies deposited in terrestrial and near-shore marine environments; (2) a gray shale and sandstone facies deposited in a shallow- to moderately-deep marine environment; (3) a dark-gray shale and siltstone facies deposited in the deepest part of the epicontinental sea. Turbidites possibly deposited from storm-generated turbidity currents, are present in facies 2 and 3. Because the rate at which the clastic wedge formed exceeded the rate of subsidence of the basin and the rise in sea level during the late Devonian, the Catskill clastic wedge intertongued with, and prograded inland over, shallow- to moderately-deep platform deposits that consisted of organic-rich black shale, gray and greenish-gray shale, and thin beds of argillaceous limestone. These platform deposits make up the black shale facies. Rocks in the black shale facies formed in marine to brackish water that covered the interior of the continent. Oil and natural gas are now being produced from Devonian shales in the western part of West Virginia and from Upper Devonian sandstones and siltstones in the north-central part of the State. It is suggested that in addition to extending known areas of gas production, that drilling for natural gas be conducted in areas underlain by organic-rich shales and thick zones of interbedded siltstone and shale in the Devonian section in central, and southern, and western West Virginia. The most promising areas for exploration are those areas where fractures are associated with folds, faults, and lineaments.

17972 **(SAND—81-0239C) Downhole electromagnetic probing of earth formations: some considerations on the inverse process accuracy.** Yu, J.S.; Reardon, P.C. (Sandia National Labs., Albuquerque, NM (USA); Science Applications, Inc., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 6p. (CONF-810612—1). NTIS, PC A02/MF A01.

From International geoscience and remote sensing symposium; Washington, DC, USA (8 Jun 1981).

The EM probe consists of conducting coils coaxially aligned to a borehole axis. The transmitting coil has a self impedance Z_{11} with a voltage source V exp(jωt), and the receiving coil has an open-circuit transfer impedance Z_{21}. Both impedances are measurable quantities that vary with the probe geometry and the EM parameters of surrounding media. The inverse process of downhole probing is to invert the desired earth-formation parameters from the measurable impedances.

17973 **(SAND—81-0492C) Dielectric log interpretation: probe responses and dielectric properties of rocks.** Lysne, P.C.; Yu, J.S.; Vittitoe, C.N.; Duda, L.E.; Reardon, P.C. (Sandia National Labs., Albuquerque, NM (USA); Science Applications, Inc., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 16p. (CONF-810616—1). NTIS, PC A02/MF A01.

From Society of Professional Well Log Analysts meeting; Mexico City, Mexico (23 Jun 1981).

Two processes involved in dielectric log interpretation are considered: the inversion of probe responses to obtain dielectric data and the subsequent conversion of these data into hydrocarbon production information. (1) Class of dielectric probes which consists of transmitter and receiver coils located along the borehole axis: The investigated problem assumes the coils and the earth to be symmetric about the borehole. Variable quantities include coil, hole and invasion zone radii, coil separations and the electrical properties of all zones. Two codes, based on analytic and on finite-difference techniques, have been developed to calculate the open circuit voltage induced in the receiver coils. These forward solutions generated a set of charts that predict the probe response for various formation parameters. In simple cases, these charts are sufficient to evaluate the formation dielectric properties from measured probe responses. However, if the formation is complicated the inversion

charts may not be adequate and other inversion techniques need to be investigated. (2) Dielectric properties of a reservoir rock: the bulk dielectric properties of an insulator containing conducting inclusions depends upon the shape of the inclusions. Thus, the geometry assumed by the water within the pore structure is important. We have followed Sillars' model of an inhomogeneous material by assuming that the water geometries may be approximated as an assemblage of spheroids with different orientations and aspect ratios. While simplistic, this model provides a method of calculating pore shapes from multiple frequency data. Permeability and rock wettability information may be contained in these geometric data.

0203 Drilling And Production

REFER ALSO TO CITATION(S) 18038, 18514

17974 (CONF-800411—(Suppl.)) **First joint SPE/DOE symposium on enhanced oil recovery, proceedings supplement.** (Department of Energy, Bartlesville, OK (USA). Bartlesville Energy Technology Center; Amoco Production Co., Tulsa, OK (USA)). 1980. 73p. NTIS, PC A04/MF A01M - 92a.

From SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (20 Apr 1980).

The First Joint Symposium on Enhanced Oil Recovery sponsored by the Society of Petroleum Engineers and the US Department of Energy was held in Tulsa, Oklahoma. Besides the thirty-three technical papers which covered all phases of enhanced oil recovery and were published in the Proceedings, the Symposium included a session on Enhanced Oil Recovery Incentives where ten papers were presented which discussed the status of enhanced oil recovery technology, and included papers on incentive programs of the United States, Canada and Venezuela. These papers are published in this Proceedings Supplement under the following titles: Federal Government Role in enhanced Oil Recovery; Financial Realities of an Adequate Petroleum Supply; Major Technology Constraints in Enhanced Oil Recovery; Decontrol-Opportunities and Dangers; Status of EOR Technology; Impact of Federal Incentives on US Production; Canadian Incentives Program; and Heavy Oil Incentives in Venezuela.

17975 (CONF-800411—(Suppl.), pp 9-10) **Federal government role in enhanced oil recovery.** Adams, M. 1980. NTIS, PC A04/MF A01.

From SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (20 Apr 1980).

The Government's role is simply to foster a climate under which the vast potential of enhanced oil recovery (EOR) is realized. There are two primary dimensions to this Government role; one is economic, the other is technological. Our economic policy rests on the concept of price deregulation. The political price paid for this concept is the Windfall Profits Tax which industry views as a serious impediment to widespread application of EOR techniques. Favorable treatment of this program under the Windfall Profits Tax has helped to encourage industry to use this program. The number of new project starts has increased from only 60 a few weeks ago to over 110 last week, and the number continues to grow. In the technological role, the Government contracted in June 1974 with Cities Service Co. the first government-industry field test on a chemical flooding project in the Eldorado Field of Kansas. To this date, a total of 27 joint projects have been contracted in the techniques of Chemical Flooding, Miscibility Flooding and Thermal Recovery. The outstanding element of this program was the freedom of information exchange. The Government role related to technology is shifting now from starting projects to the analysis of the results. The volumes of data now becoming available must be processed, and reduced to a form rapidly useable. The Government's role is therefore to help foster the understanding of EOR processes to the point that, from a technology standpoint, they will be considered viable candidates for investment and commercial application.

17976 (CONF-800411—(Suppl.), pp 11-13) **Enhanced oil recovery, an investment opportunity.** Bookout, J.F. 1980. NTIS, PC A04/MF A01.

From SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (20 Apr 1980).

Enhanced oil recovery must become a national priority if it is to bridge the energy gap in the 1980's or 1990's. It is urgent that both industry and government cooperate to: remove or reduce government controls and taxes that stifle incentive; attract and reward the talent necessary to develop and produce the resource; expand the exchange of information and technology; and above all...to recognize Enhanced Oil Recovery as a top national priority. The target is 24 billion barrels of oil which the nation sorely needs.

17977 (CONF-800411—(Suppl.), pp 15-18) **Effects of environmental regulations on enhanced oil recovery.** McCloskey, M. 1980. NTIS, PC A04/MF A01.

From SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (20 Apr 1980).

Of the problems that enhanced oil recovery (EOR) poses to the environment, air pollution from thermal applications clearly poses the most pressing and real impact. However, for the most part control techniques are available, and the problems are being addressed. Few problems have yet been identified with the use of gases in EOR, except for the impact of long-distance pipelines. The problems posed by the impact of chemicals on sub-surface waters seems to present the greatest source of concerns, but largely represents a bundle of unknowns which must be carefully researched. In contrast, problems involved in protecting surface waters appear to be familiar, though the challenge will grow and even greater diligence is required. Since chemical applications are the most speculative and costly, one can hope that research can keep pace with need to protect the environment while EOR moves ahead to sustain US oil supplies.

17978 (CONF-800411—(Suppl.), pp 25-33) **Major technology constraints in enhanced oil recovery.** Kuuskraa, V. 1980. NTIS, PC A04/MF A01.

From SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (20 Apr 1980).

The work of the past many years is forming a base of valuable knowledge, yet widespread use of the enhanced oil recovery (EOR) technologies is still constrained by: severe geologic limits; lack of scientific understanding of the basis oil displacement phenomena in several of the more complex EOR process; and an inability to reliably predict performance across varied reservoir settings. Specific technological constraints for each of the following EOR processes are also mentioned; steam drive, in-situ combustion, carbon dioxide flooding, and chemical flooding. In summary, the technical status on EOR shows that: while an improved understanding is being gained of the problems and the technical limits enhanced oil recovery is still far from being an efficient or reliable technology; and the potential of EOR is major, ranging from 10 billion to 40 billion barrels of future recovery, but the final amount will depend on how well and how fast the technologies develop. The question is: is there sufficient incentive or commitment to make the essential R & D investments to turn this potential into a reality.

17979 (CONF-800411—(Suppl.), pp 43-53) **Status of EOR technology.** Welch, L.W. Jr. 1980. NTIS, PC A04/MF A01.

From SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (20 Apr 1980).

Enhanced oil recovery (EOR) will make a significant contribution to the nation's oil reserves. However, difficult and serious technical problems remain to be solved. Some of these technical problems are mentioned before the status and outlook for enhanced recovery in the lower 48 states are discussed. The paper mentions that the ultimate potential for present EOR methods in known fields in the lower 48 states is estimatd to be 20 billion barrels. This represents about a three-year supply at current total domestic consumption rates. On the other hand, it also represents two Prudhoe Bays and is more than one-half of current US reserves. There will be more singificant production from EOR techniques during this decade. Steam injection will continue to be a major production method. Miscible gas processes have the most potential for near-term production of light oil and could make a contribution by the mid-1980's. More time will be needed to commercialize surfactant processes and to supply the large quantities of surfactant and polymer that will be needed. Even so, surfactant flooding should begin to make a contribution by the end of the decade.

17980 (CONF-800411—(Suppl.), pp 55-58) **Impact of federal incentives on US production.** Rollins, H. 1980. NTIS, PC A04/MF A01.

From SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (20 Apr 1980).

After nearly seven years of control regulations to the petroleum industry, the Government has come out with a funding regulation. It provides direct and immediate funding support to pay for a substantial portion of the high front-end costs of enhanced recovery projects. It does so, not by a government grant or subsidy, but by manipulation of the price control regulations. The regulation is 10 CFR 212.78, Tertiary Incremental Crude Oil and Tertiary Incentive Crude Oil. Its stated purpose is to increase domestic crude oil production. It achieves its purpose out of recognition that enhanced oil recovery projects encounter very high front end costs, and, being conducted at the technological frontiers of oil recovery, faces foreboding risks of failure. Most enhanced oil recovery ventures are still largely experimental. They need to become commercial. The paper describes in detail how the funding program of incentive regulation works. Breifly stated, if one has an oil recovery project that employs, or will employ, a certifiable tertiary technique, and has it certified with the Economic Regulatory Administration, he will be allowed to recoup up to 75% of certain cost incurred undertaking the project. The cost is recouped indirectly. One is permitted to sel price controlled crude at the free market price, and then use the difference between the ceiling price and market price to offset those project costs.

17981 (CONF-800411—(Suppl.), pp 59-64) **Canadian incentives program.** Bowman, C.W. 1980. NTIS, PC A04/MF A01.

From SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (20 Apr 1980).

Production of petroleum in Alberta, Canada reached a peak of approximately 1,600,000 BPD in 1974, and has since declined to less than 1,400,000 BPD. This reduction has occurred in spite of the existence of substantial inplace resources of conventional petroleum heavy oil and oil sand. The lack of efficient recovery technology is one of the factors responsible for the decline. To increase the pace of development of new technology, the Government of Alberta has instituted a number of incentive programs, ranging from reduced royalties for production derived from new tecnology, to joint participation in high cost experimental field projects. In addition, the Canadian Federal Government has developed a taxation policy appropriate for high risk, high initial cost non-conventional petroleum activities. This paper summarizes some of the incentive schemes available to petroleum companies operating in Alberta.

17982 (CONF-800411—(Suppl.), pp 65-71) **Heavy oil incentives in Venezuela.** Eraso, G.R. 1980. NTIS, PC A04/MF A01.

From SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (20 Apr 1980).

The oil industry in Venezuela has been nationalized since January 1, 1976. Consequently the concept of incentives in terms of special tax, royalty or pricing condition are not applicable. Incentives are used in this paper in a broad sense as opportunities that exist both for the utilization of enhanced oil recovery methods by the producing countries, and also for steps that could be taken by consuming countries to make heavy oil upgrading capacity available in their refineries. Venezuela's oil policy includes both realizing a substantial effort to upgrade in the country as much heavy oil as its overall resources will permit, and to encourage consumers to install upgrading facilities to process Venezuela's virgin crudes. Highlights of this paper are: (1) enhanced oil recovery techniques could be a major factor in world oil supplies by substantially increasing recovery from heavy oil reservoirs; (2) Venezuela has a large proportion of the world's heavy oil, mainly in the Orinoco Oil Belt; (3) Venezuela is going ahead with major heavy oil production and upgrading projects; (4) to incorporate the potential increased availability of heavy oils into the world's supply, consuming countries will have to install upgrading capacity at their refineries to meet product demand patterns; and (5) Venezuela is willing to cooperate and share technical information with customers desiring to incorporate heavy oils into their crude supplies.

17983 (CONF-810438—) **Symposium on enhanced oil recovery.** (Society of Petroleum Engineers (AIME), Dallas, TX (USA); Department of Energy, Bartlesville, OK (USA). Bartlesville Energy Technology Center). 1981. 619p. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

The Second Joint Symposium on Enhanced Oil Recovery was held in Tulsa, Oklahoma on April 5 to 8, 1981. Forty-four technical papers were presented which covered all phases of enhanced oil recovery. Field tests, laboratory investigations, and mathematical analyses of tertiary recovery methods such as microemulsion flooding, carbon dioxide injection, in-situ combustion, steam injection, and gas injection are presented.

17984 (CONF-810438—, pp 7-19) **Fireflooding a high gravity crude in a watered-out west Texas sandstone. Paper SPE 9711.** Anthony, M.J. (Gulf Oil Exploration and Production Co., Oklahoma City, OK); Taylor, T.D.; Gallagher, B.J. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

This paper describes the results, operational problems encountered, and the ongoing technical evaluation of an in-situ combustion pilot project in the North Ward-Estes Field located in Ward County, Texas. This sandstone reservoir was discovered in 1929 and has been under waterflood since 1955. Even though the reservoir characteristics were marginal in comparison to the screening criteria for in-situ combustion, laboratory tests indicated this process could be viable.

17985 (CONF-810438—, pp 29-56) **State-of-the-art review of fireflood field projects. Paper SPE/DOE 9772.** Chu, C. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

This paper embodies a state-of-the-art review of fireflood field projects. Based on reservoir data on 25 selected successful fireflood projects and 9 aborted projects, a new screening guide has been developed for firefloods. A new regression equation was also developed which will allow prediction of air requirements with known reservoir characteristics. Methods of predicting other performance variables such as fuel content, sweep efficiency, oil recovery and air-oil ratio are discussed. Industry experience on project design is reviewed in regard to the choice between dry and wet combustion and determination of pattern type and size, air injection rate, water-air ratio and completion intervals. Special well completions needed for fireflood are reviewed as well as the various ignition methods. Operational problems plaguing the fireflood projects, which include poor injectivity or productivity, corrosion, erosion, emulsion and explosion hazards, are discussed along with their remedies.

17986 (CONF-810438—, pp 57-63) **Feasibility evaluation of a downhole steam generator. Paper SPE/DOE 9775.** Wright, D.E.; Binsley, R.L. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

Downhole steam generation has been recognized for several years as potentially beneficial because of the reduced heat loss and improved steam quality when compared to conventional steam generators. This paper describes the great strides made by Rocketdyne in the development of a downhole steam generator; benefits and features are described. The work was done under the management of Sandia Laboratories as part of the Department of Energy's Project Deep Steam. The effort began with a comparison of alternate ways of generating steam downhole. The most economical was found to be the indirect system where heat from low pressure (approximately 5 atm) combustion of fuel oil and air is transferred to high-pressure water. A feasibility test unit was constructed and tested extensively; results are described. Comparative economic analyses indicate that the downhole steam generator is competitive with conventional systems even at moderate depths. Below 2500 feet, it is a clear choice. The system is currently ready for a prototype demonstration in a downhole environment.

17987 (CONF-810438—, pp 65-78) **Development of technology for downhole steam production. Paper SPE/DOE 9776.** Fox, R.L.; Donaldson, A.B.; Mulac, A.J. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

Two concepts for downhole production of steam for drive operations have been selected for comparative development. The two designs differ in method of transferring heat from hot combustion gases to produce steam. A low pressure combustion design transfers energy to water through a heat exchanger thus enabling the combustion process to be conducted at a pressure less than the injection pressure; a high pressure combustion design mixes the combustion gases directly with water, resulting in the injection of steam and combustion gases into the reservoir. The comparative development program has included analysis of energy efficiency, computational examination of recovery, core recovery experiments, and field evaluation. Field tests have been conducted under low reservoir injection pressure (2.76 MPa). The tests were carried out in a 260 m (800 ft) deep reservoir utilizing a 2.5 acre five spot pattern. Data collected from injection and production wells included fluid flow rates, fluid compositions, and energy content. The reservoir conditions were monitored by a combination of global flow measurements and simultaneous core flow tests. Test results have demonstrated that the recovery with the high pressure combustion design is equivalent to the low pressure design at low reservoir pressure. The injection of combustion gases with steam have reduced the quantity of air contaminents released to the atmosphere.

17988 (CONF-810438—, pp 79-88) **Field demonstration of steam drive with ancillary materials. Paper SPE/DOE 9777.** Doscher, T.M.; Hammershaimb, E.C. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

CLD Group, Inc., is conducting field demonstration tests together with DOE on the use of ancillary materials to improve the efficiency of conventional steam drive. During the past year, laboratory tests were conducted to identify surfactants with the best foam blocking potential, as well as optimum techniques for injecting the foaming materials. The first field test of foam injection using a 5-spot pattern in the Midway-Sunset field is currently underway. Radioactive tracers were employed to determine the extent of the thief zone before and after injecting surfactant.

17989 (CONF-810438—, pp 89-96) **North Kern Front Field steam drive with ancillary materials. Paper SPE/DOE 9778.** Eson, R.L.; Fitch, J.P.; Shannon, A.M. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

Since steam injection became a viable recovery technique nearly three decades ago, the problems of gravity segregation and poor areal and vertical sweep efficiencies have limited recoveries in many heavy oil reservoirs. In many instances the injected steam prematurely breaks through into producing wells creating steam channels. It is believed that overall recoveries of a steam drive can be improved if the steam channeling can be controlled. This paper documents efforts under a Department of Energy cost sharing contract to reduce steam channeling in a conventional steam drive using ancillary materials. A steam foam solution and a steam foam encapsulated in a polymer gel are being introduced in four steam injection patterns in the North Kern Front Field near Bakersfield, California. The ability of the ancillary materials to improve recovery will be determined through injection profiles, chemical tracer surveys, casing vent gas analysis, core and log data, and residual oil saturation data, as well as through temperature and production data. It has been shown that in-situ steam foams can be used to alter the steam injection profiles to prevent excessive steam channeling. The results of early production data have indicated that as much as 125 B/D of incremental oil is being produced by the four chemical treated patterns.

17990 (CONF-810438—, pp 97-122) **Design of preflush for commercial scale polymerflood in the North Burbank Unit. Paper SPE/DOE 9779.** Pang, H.W.; Fleming, P.D. III; Boneau, D.F. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

Optimum preflush size for a 1440-acre polymer-flood in the North Burbank Unit, Osage County, Oklahoma was estimated as 120 days at 63,000 BWPD (0.073 pore volumes) with a cross-sectional reservoir simulator that incorporates a realistic treatment of the compositional dependencies of resistance and residual resistance effects. The optimum preflush size differs from tract to tract, varying from 150 days to less than 30 days of fresh water injection. These differences can be attributed to the different degrees of brine cross-flow which are associated with the layer structures of the nine different tracts. Brine cross-flow reduces the incremental oil recovery due to the polymer since resistance and residual resistance effects are significantly reduced in the presence of high-salinity brine. The detrimental effects of salinity can result in a loss of up to 20% of the incremental oil. A plot of predicted tertiary oil versus preflush size for the total project shows that a preflush does not significantly improve the performance of the polymer. The amount of tertiary oil is almost constant for preflushes between 60 and 180 days with a broad maximum at 120 days. A fresh water preflush of 120 days was recommended to maximize incremental oil from these tracts and to fit the construction schedule for the required facilities. The observed dependence of predicted recovery on preflush size resulted from a realistic treatment of the effects of salinity, polymer adsorption and polymer concentration on polymer performance in the computer model.

17991 (CONF-810438—, pp 123-137) **Evaluation of surfactant EOR potentials using a scaling law interpretation of core flood residual oil saturation profiles. Paper SPE/DOE 9780.** Davis, L.A.; Tyler, T.N.; Brost, D.F.; Haskin, H.K. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

The screening of surfactant candidates for a given reservoir can be improved by using linear core flood residual oil saturation profiles measured along the core after chemical flooding. A surfactant formulation's functional relation of oil recovery with slug size can be calculated from a single core flood with the assumption of a relaxed scaling law. This slug size relation can then be combined with knowledge of the reservoir to provide an improved means of initially screening surfactant candidates. A volumetric linear scaling approach is developed from laboratory core flood data. Residual oil saturation profiles measured in reservoir material with a microwave absorption instrument support this approximate scaling relation. A statistical analysis of 32 linear core flood water floods and surfactant slug floods is presented as additional verification. The limits of this scaling law are defined, with emphasis on the role of mixing and dispersion. The procedure for using saturation profiles to calculate oil recovery as a function of slug size is developed and a test case presented. A recovery relation derived from a single core flood saturation profile is compared with that determined by multiple conventional core floods. As an example, a recovery versus slug size relation is assumed for a layered linear flood. High core flood oil recovery at one volume throughput is shown to be an insufficient criterion for surfactant system selection.The flow distribution of surfactant and the entire oil recovery versus slug size relation can be dominant factors in the overall performance. The use of saturation profiles is a more efficient means of obtaining the recovery relations and allows introduction of reservoir flow distribution properties as an integral part of the initial surfactant screening process.

17992 (CONF-810438—, pp 139-148) **Sloss micellar/polymer flood post test evaluation well. Paper SPE/DOE 9781.** Taggart, D.L.; Russell, G.C. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

A successful post-test evaluation well was drilled in the Sloss Field, Kimball County, Nebraska, following a micellar-polymer flood. Drilling and sampling procedures are discussed which help insure valid data. Sulfonate loss, adsorption plus partitioning, was determined to be 0.4 of a pound per barrel (1.1 Kg/m^3) of pore space. From core analysis and logging survey, oil was displaced over the entire pay interval from the average post waterflood residual of 30%, although some of the lower permeability zones had a

final oil saturation of up to 16% compared to the average of 8%. The polyacrylamide polymer used in the mobility control bank was severly degraded causing the loss of mobility control. The degradation was not caused by a simple thermally induced hydrolysis. Limited tests indicate well workover fluids may have contributed to the degradation.

17993 (CONF-810438—, pp 149-169) **Dispersive mixing effects on the Sloss Field micellar system. Paper SPE/DOE 9782.** Gupta, S.P. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

This paper presents results of laboratory experiments and computer simulation studies of the micellar/polymer fluids injected in the Sloss Field, Nebraska. The paper shows: (1) the dispersion coefficient for the partitioned sulfonate in the oil phase can be an order of magnitude larger than the dispersion coefficient in the water phase, and (2) polymer in the injected micellar fluid does not necessarily provide the needed viscosity for displacement where sulfonate-rich oil phase is generated. The results show the two principal components of the micellar fluid (sulfonate and polymer) propagate at different rates due to partitioning and dispersive mixing effects. Sulfonate is produced much earlier than polymer and is concentrated in the produced oil. Sulfonate partitions into the oil phase as a consequence of ion exchange, and the polymer remains in the water phase. The oil phase which contains the partitioned sulfonate has high mobility. The increased dispersion coefficient for a component in the nonwetting phase, in this case the partitioned sulfonate into the oil phase, is supported by an independent study. These mechanisms contribute to early sulfonate breakthrough and a larger sulfonate requirement per barrel of oil displaced than anticipated for a non-dispersive displacement. The results of this paper can be beneficial for design of other micellar fluids, and performance predictions and interpretation of micellar floods in other fields.

17994 (CONF-810438—, pp 171-186) **Effect of interfacial tensions on relative oil-water permeabilities of consolidated porous media. Paper SPE/DOE 9783.** Amaefule, J.O.; Handy, L.L. (Univ. of Southern California, Los Angeles). 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

Relative permeabilities of systems containing low tension additives are needed to develop some mechanistic insights as to how injected aqueous chemicals affect fluid distribution and flow behavior. This paper presents the results of an experimental investigation of the effect of low interfacial tensions on relative oil-water permeabilities of consolidated porous media. The steady state dynamic and unsteady state displacement methods were used to generate the relative permeability curves. Aqueous low concentration surfactant systems were employed to vary the interfacial tension levels. Empirical correlations were developed that relate the imbibition relative permeabilities; apparent viscosity, residual oil and water saturations to the interfacial tension through the capillary number (N/sub c/ = $v\mu/\sigma$). They require two empirical, experimentally-generated coefficients. The experimental results show that the relative oil-water permeabilities at any given saturation are affected substantially by interfacial tension values lower than 10^{-1} mN/m. Relative oil-water permeabilities increased with decreasing interfacial tensions (increasing N/sub c/). The residual oil and residual water saturations (S/sub or/ and S/sub wr/) decreased, while the total relative mobilities increased with decreasing interfacial tension. The correlations predict values of relative oil-water permeability ratios, fractional flow and residual saturations that agree with our experimental data. Apparent mobility design viscosities decreased exponentially with the capillary number.

17995 (CONF-810438—, pp 187-196) **Generation of ultralow tensions over a wide EACN range using Penn state surfactants. Paper SPE/DOE 9784.** Klaus, E.E.; Jones, J.H.; Nagarajan, R.; Ertekin, T. (Pennsylvania State Univ., University Park). 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

Three types of ingredients for surfactant slugs have been prepared from saturated hydrocarbons using vapor phase oxidation followed by sulfonation. The three ingredients include: oxidized hydrocarbons in the form of cyclic ethers; predominantly monosulfonates from the sulfonation of these cyclic ethers; and polysulfonates from multiple sulfonation of the cyclic ethers. The cyclic ethers can be separated from the vapor phase oxidized product by a methanol extraction procedure while the two sulfonate fractions can be separated from the sulfonation product by isopropyl alcohol extractions. The PRL monosulfonates show surfactant behavior very similar to that of the conventional aromatic sulfonates. The PRL monosulfonates can be blended with or substituted for conventional aromatic sulfonates to produce low interfacial tensions between brine and oil. The use of PRL polysulfonates with either conventional aromatic sulfonates or PRL monosulfonates appears to enhance the lowering of brine-oil interfacial tension. More significant is the observation that the use of PRL polysulfonates gives low interfacial tensions over a very wide range of oil equivalent alkane carbon number (EACN) values. In addition for the same or lower average equivalent weights these mixed surfactants provide low interfacial tensions against oils of higher EACN. The use of cyclic ethers as a cosurfactant with conventional sulfonates or PRL mono or mixed sulfonates appears to enhance the mixture by producing lower interfacial tensions that generally extend to higher values of EACN. The combinations of PRL mono and polysulfonates with cyclic ethers appear to provide a unique surfactant system which will tolerate high salt concentrations and provide low interfacial tensions over a wide range of EACN. The three PRL surfactants discussed in this paper can be generated from the desired fraction of any crude oil as produced by a combination of simple energy efficient reactors.

17996 (CONF-810438—, pp 197-212) **Carbon dioxide displacement of a West Texas reservoir oil. Paper SPE/DOE 9785.** Yellig, W.F. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

Miscible carbon dioxide flooding is rapidly developing as a commercial enhanced oil recovery process. Successful design and interpretation of CO_2 pilots and fieldwide floods are dependent on a good knowledge of the reservoir and the CO_2 displacement process. This paper presents results of an extensive study to better understand CO_2 displacement of Levelland reservoir oil. The work was conducted to support Levelland CO_2 pilots currently in progress. Experimental displacement tests were conducted at various pressures, core lengths, and CO_2 frontal advance rates. The experimental system included a novel analytical technique to obtain effluent compositional profiles within the oil moving zone at test conditions. These data quantify the displacement process. The results of this study show that at pressures greater than the CO_2 minimum miscibility pressure, a multiple contact miscible displacement mechanism predominates. Miscibility is developed in situ by a vaporization or extraction type of mass transfer. The lengths required for CO_2 to develop miscibility were found to be dependent on the phase equilibria of the CO_2-Levelland oil system. Displacements requiring the greatest length to develop miscibility were at pressures where mixtures of CO_2 and Levelland oil form two liquid phases. In addition, the mechanistic information obtained from this study is used to interpret the process data from the pilot test. The results have application to other reservoir oils whose phase equilibria with CO_2 are similar to the CO_2-Levelland oil system.

17997 (CONF-810438—, pp 213-226) **Utilization of composition observation wells in a West Texas CO_2 pilot flood. Paper SPE/DOE 9786.** Henry, R.L.; Feather, G.L.; Smith, L.R.; Fussell, D.D. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

Two composition observation wells were drilled in a tertiary CO_2 pilot in the Levelland Field, Hockley County, Texas. The purposes of these wells were to: (1) confirm the laboratory determined mechanisms of oil displacement from the composition analysis of mobilized fluids; (2) obtain mixing zone length and growth information to improve estimates of CO_2 requirements for fieldwide floods; (3) determine relative mobilities of the various banks, and (4) obtain information on CO_2-reservoir rock interactions. Composition data confirmed miscible tertiary oil displacement. A small CO_2-free oil bank was detected followed by a relatively large oil moving zone which grew with distance traveled from the injection well. The initial analysis of the oil moving zone growth was consistent with a

laboratory determined correlation based on first contact miscible fluids. Volumetric data, which are the changes in bottom-hole water-oil ratio with time, indicated more than one zone was swept by the carbon dioxide. Logging observation well data confirmed this conclusion. Bottom-hole pressure data recorded in the composition observation wells showed a cyclic trend with higher pressures occurring during the CO_2 injection cycle and lower pressure occurring during the water injection cycle. Preliminary calculations of the total mobility of fluids flowing between the observation wells suggested an in-depth mobility reduction during the CO_2 slug process as compared to the pre-CO_2 waterflood. Analyses of the water obtained in the sampler indicated CO_2 displaces connate water and slowly reacts with the reservoir rock.

17998 (CONF-810438—, pp 227-244) **High pressure model studies of oil recovery by carbon dioxide. Paper SPE/DOE 9787.** Doscher, T.M.; El-Arabi, M. (Univ. of Southern California, Los Angeles). 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

Linear scaled physical model studies were designed and carried out to study the recovery of crude oil by the injection of carbon dioxide. Viscous and gravity forces and molecular diffusion were explicitly scaled to field conditions. Mechanical dispersion was not scaled, and is exaggerated in the models. Because both the line drive, in contrast to a radial pattern, and the low permeability of the prototype reduce the relative influence of gravity segregation, and the exaggeration of mechanical dispersion in the model reduces the effects of viscous fingering and gravity override; the results of these studies yield optimistic results in comparison with those that may be expected under field-operating conditions. The results reveal that two factors dominate the recovery process: the high mobility of the carbon dioxide, and its solubility in the subject crude oil. The latter in turn appears to be a function of the density of the carbon dioxide. The effects of pressure, temperature, oil saturation, and slug size on recovery were studied in some detail, and the effect of the composition of the oil to a limited extent. A degree of criticality is observed with respect to the size of the slug on its influence on recovery and the carbon dioxide required to recover a barrel of crude oil. By controlling the slug size, about half of the residual oil can be recovered at ratios of less than 10 MSCF/B whereas continuous injection will recover more of the residual oil but only at ratios in excess of 20 MSCF/B. No banking of the crude oil is observed and carbon dioxide production occurs rapidly and concomitantly with oil. The complex phase behavior of carbon dioxide, the separation of the heavy fractions and solution of the light fractions in the dense carbon dioxide gas, occurs only after the carbon dioxide has reached a high saturation in the system, and therefore contributes little to the up-front (economic) recovery of residual oil.

17999 (CONF-810438—, pp 245-258) **Microscopic investigation of CO_2 flooding process. Paper SPE/DOE 9788.** Wang, G.C. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

Visual examinations of microscopic behavior of CO_2 flooding processes were conducted using a high pressure glass-bead packed transparent flow tube. The apparatus and techniques developed made it possible to observe the physical phenomena of the displacement of oil by CO_2 under both miscible and immiscible conditions. Also investigated were the effects of CO_2 slug size and formation dip on oil recovery. The test results were recorded in a series of magnified color photographs for after-run study and interpretation. Three types of displacement were observed within the testing pressure range. These were: (a) immiscible, (b) semi-miscible, and (c) miscible. Type (b) is an evaporating process in which oil is disintegrated into micro-size particles and transported amid the CO_2 stream. More than one type of displacement could co-exist in a flooding system. Under dynamic displacement and constant temperature conditions, miscibility could occur within a wide range of pressures. Higher pressures would promote early development of miscibility and thus result in better oil recovery. A CO_2 slug that is too large is wasteful and may cause early CO_2 breakthrough. A slug too small would allow the trailing water to channel through the oil bank and degenerate the CO_2 process to an ordinary waterflooding; nevertheless, the oil recovery would be significantly increased over that obtained from plane waterflooding. The water phase in the waterflooded area can be displaced by CO_2 and recovery of residual oil may be accomplished by either semi-miscible or miscible displacement. Oil swelling appears to play a major role in forming an oil bank. Oil recovery could be increased considerably with down-dip displacement. The increase is primarily derived by reducing CO_2 override and expediting the development of miscibility.

18000 (CONF-810438—, pp 259-268) **Laboratory study to determine physical characteristics of heavy oil after CO_2 saturation. Paper SPE/DOE 9789.** Miller, J.S.; Jones, R.A. (Dept. of Energy, Bartlesville, OK). 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

Petroleum recovery techniques are being developed by laboratory experimentation by personnel at the Bartlesville (Okla) Energy Technology Center, US Department of Energy. These techniques are being studied and developed to aid production from shallow, low productivity, heavy oil sand deposits in southeastern Kansas, southwestern Missouri and northeastern Oklahoma. Heavy oil samples ranging from 10 to 17° API gravity (1.000 to 0.953 g/cm^3) were tested to determine physical characteristics of heavy oils before and after CO_2 saturation. The experimentation was conducted using a modified PVT apparatus designed and constructed at BETC. Viscosity, density, saturation and swelling factor were determined at temperatures of 75°, 140° and 200°F (24°, 60° and 93°C) and at eleven pressures ranging from 200 to 5000 psi (1400 to 34,500 KPa) at each temperature.

18001 (CONF-810438—, pp 269-281) **Measurement and correlation of CO_2 miscibility pressures. Paper SPE/DOE 9790.** Johnson, J.P.; Pollin, J.S. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

At sufficiently high injection pressures, nonhydrocarbon gases become miscible with crude oil and are capable of displacing petroleum fluids from a porous rock matrix with high efficiency. This report details the experimental methods used to determine CO_2 minimum dynamic miscibility pressures (MDMP) and describes the relationship between the onset of miscible fluid flow and static-cell PVT behavior. An accurate empirical correlation will be presented which predicts the MDMP for a wide variety of live oils and stock oils with both pure and diluted CO_2. This correlation, requiring only the oil gravity, molecular weight, reservoir temperature and injection gas composition, shows substantially better agreement with experiment than methods previously published. To the extent that the MDMP represents an optimum field operating pressure during tertiary oil recovery processes, the correlation can be used for rapid estimation of injection gas costs.

18002 (CONF-810438—, pp 238-300) **Results of micellar-polymer flood in a flooded-out, low gravity reservoir. Paper SPE/DOE 9791.** Staub, H.L. (City of Long Beach, CA). 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

This paper presents the early results of a micellar-polymer demonstration project in the Wilmington Field, California. This report is a joint venture between the City of Long Beach and the US Department of Energy, designed to establish a tertiary oil recovery technique applicable to unconsolidated low-gravity oil sands typical of many in the California Coastal Province. The pilot area is located on the flank of an essentially watered-out reservoir and contains about 10 acres with an average net thickness of 58 feet. This paper briefly describes some of the early problems encountered in initiating the project, how they were solved, and their possible effect on the final outcome of the flood. The results of a tracer test program are reviewed and related to the initial response to the chemical injection. Some operational difficulties relating to breakthrough of the chemical constituents are revealed. The current response to micellar-polymer injection is presented and analyzed.

18003 (CONF-810438—, pp 301-315) **Manvel enhanced recovery pilot: performance evaluation. Paper SPE/DOE 9793.** Widmyer, R.H.; Pindell, R.G. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

A surfactant-polymer pilot flood was conducted in the Manvel Field, Brazoria County, Texas. The purpose of this report is to present the test results and conclusions based upon an interpretation of the performance response. The data reviewed and the results of the computer simulation lead to the following conclusions regarding the pilot performance: (1) The natural water influx had minimal effect on the injected fluid distribution. (2) Well A-42 is in communication with the underlying sands due to an ineffective shale barrier, thus delaying and diluting tracer responses. (3) Well Pairs A-41/A-43 and A-45/A-44 act independently and may be partially separated by a fault. (49 Well pair A-41/A-43 had significant crossflow into the underlying sand. (5) Well Pair A-45/A-44 injected surfactant was confined to the target sand. (6) The surfactant and polymer solution fronts advanced radially due to their high viscosities compared to reservoir brine (mobility effects), thus moving injected liquids to areas where there were no producers. Repeated flood patterns would give improved sweep efficiency over the present unconfined pattern. (7) After fresh water breakthrough, the chemical fronts essentially stopped advancing due to mobility effects. (8) Due to mobility effects, the volume swept by the low salinity water drive was 7392 m^3 or 37% of the volume contacted by the chemicals. (9) Tertiary oil production was 707 m^3 above the water flood decline. (10) The surfactant retention was 1.7 (mg surfactant/g rock). (11) The chemical flood recovery efficiency in the swept volume was 44%. Laboratory core floods yielded an average of 56.5% recovery for 38 sand pack floods. (12) The surfactant utilized (retained) for this process was 111 kg surfactant/m^3 oil produced.

18004 (CONF-810438—, pp 317-333) **Performance of Deutsche Texaco AG's Oerrel and Hankensbuettel polymer floods. Paper SPE/DOE 9794.** Maitin, B.K.; Volz, H. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

In 1975 Deutsche Texaco AG initiated a polymer pilot flood in a part of the Oerrel field. The main objective was to plug off a zone of high permeability in the reservoir and hereby improve the areal sweep efficiency of flood operations. A second polymer project was brought into operation in a part of the homogeneous Hankensbuettel field in 1977. In this paper flood performance is described. Both floods are considered successful and polymer application was extended to larger parts of both fields.

18005 (CONF-810438—, pp 335-348) **Lick Creek Meakin Sand Unit immiscible CO_2: waterflood project. Paper SPE/DOE 9795.** Reid, T.B.; Robinson, H.J. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

This paper reviews the performance of an immiscible carbon dioxide waterflood project conducted at the Lick Creek Meakin Sand Unit, Arkansas, for the past five years. The project is being conducted in four distinct phases, utilizing 16 injectors and 38 producers on 1640 acres. The phases are: (1) cycling all wells with CO_2, (2) CO_2 injection into the permanent injectors, (3) CO_2 - water injection into the permanent injectors, and (4) finally, water injection into the permanent injectors. Presently, the project is in Phase 3. The reservoir produces a 17° API oil, having a reservoir viscosity of 160 cp at the reservoir temperature and pressure of 118°F and 1200 psi, respectively. Original oil in place was 23.3 million barrels, with about 4.5 million barrels (19% of the original oil in place) being produced by pressure depletion and a weak water drive in the 20 years before the project. Prior to CO_2 injection, the field was being pumped at a rate of 230 BOPD, a low GOR, and a WOR of 21. During the huff and puff phase all wells flowed naturally. Presently, in Phase 3, all wells are on gas lift by carbon dioxide with plans on reverting to beam pumping in the final waterflooding phase of the project. After 5 years of operation 14 billion scf of carbon dioxide have been injected and over 1 million barrels of oil have been produced. About 755,000 barrels are considered additional oil due to the process. Field rates have been as high as 1400 BOPD with the present rate being 833 BOPD. The conclusions drawn are the project is successful and the immiscible carbon dioxide-waterflood process is a viable process for thin heavy oil sands.

18006 (CONF-810438—, pp 349-358) **Slaughter Estate Unit tertiary pilot performance. Paper SPE/DOE 9796.** Rowe, H.G.; York, S.D.; Ader, J.C. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

Secondary performance of the Slaughter Estate Unit Tertiary Pilot was typical of the surrounding waterflood leases, and has been successfully matched using a three-phase reservoir simulator with petrophysical, pressure transient and performance data as input. Although a final tertiary prediction has not yet been developed, the time of tertiary oil response and the peak response rate are in agreement with preliminary predictions obtained in initial pilot studies. Estimates of ultimate tertiary recovery for the pilot indicate that the additional recovery will be 20 to 25% OOIP over the expected 52% OOIP ultimate primary and secondary recoveries. Although the injected CO_2 gas stream contained approximately 28% H_2S, initial laboratory tests and analysis of produced fluid composition data have shown that the multiple contact miscible gas process is the same as that expected for pure CO_2 in this type of reservoir. Alternate gas and water injection resulted in reduced injectivity during the solvent injection phase of the project, but subsequent oil producing rates have shown that the alternate injection sequence has provided for excellent areal sweep. Injectivity during the chase gas phase has been comparable to waterflood injectivity, but to date ony 37% of the injected chase gas has been retained in the reservoir. This contrasts sharply with the estimated 60% current retention level of injected solvent. High chase gas breakthrough rates should be anticipated in other projects similar in design. Performance of the SEU Tertiary Pilot has shown that significant quantities of tertiary oil can be recovered in the carbonate San Andres formation using CO_2 as a solvent.

18007 (CONF-810438—, pp 359-374) **Micellar-polymer oil recovery demonstration in the Bell Creek Field. Paper SPE/DOE 9797.** Goldburg, A.; Stevens, P.D. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

Gary Energy Corporation is conducting a DOE pilot Demonstration to determine whether micellar-polymer waterflooding is an economically feasible technique for enhanced oil recovery at the Bell Creek Field, Powder River County, Montana. The pilot is a contained 40-acre 5-spot embedded in a representative watered-out portion of the field. The reservoir is sandstone with an average net pay of 6.4 feet, air permeability of 1050 md, porosity of 29%, and water TDS of 4000 ppM. The pilot has four injectors (Wells MPP-1, MPP-2, MPP-3 and MPP-4) and one producer (Well 12-1). The overall micellar-polymer oil recovery is estimated at 47% of the remaining oil at the initiation of the micellar-polymer flood. Since the last review of this project the micellar slug and approximately one-half of the polymer slug have been injected. Problems encountered during chemical injection and their treatment are discussed. A review of the produced fluid data is presented; and the numerical simulator prediction of oil recovery, completed prior to initiation of chemical injection, is compared to field data. Pilot costs and derived economic ratios are set forth. Finally, the evolution and structure of a post-pilot analysis are presented.

18008 (CONF-810438—, pp 375-388) **San Andres reservoir pressure coring project for enhanced oil recovery evaluation, Bennett Ranch Unit, Wasson Field, West Texas. Paper SPE/DOE 9798.** Swift, T.E.; Goodrich, J.; Kumar, R.; McCoy, R.L. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

During late 1979, Gruy Federal Inc., under contract to DOE, participated with the operator in pressure coring operations in Texas Pacific BRU No. 310, Bennett Ranch Unit, Wasson field, west Texas. The well was planned as part of a program to continue development of the waterflood unit on 20-acre spacing. In all, 26

cores were cut over a 210-foot interval of the San Andres dolomite. The cored interval extended some 50 feet below the estimated original oil-water contact, allowing evaluation of CO_2 floodable oil saturation in the transition zone. The analysis of the pressure coring data has provided valuable information that could not have been obtained from conventional cores and/or logs.

18009 (CONF-810438—, pp 389-402) **Waterflood residual oil saturation technology test in a semi-consolidated sandstone reservoir. Paper SPE/DOE 9800.** Myal, F.R.; Wesson, T.C. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

Gary Energy Corporation has conducted for the US Department of Energy an evaluation of the technology available to measure residual oil saturation following waterflood secondary oil recovery processes in the Bell Creek Field, Powder River County, Montana. This paper presents the results of ten stand alone tests conducted to determine waterflood residual oil saturation. The engineering techniques used in an attempt to determine the magnitude and distribution of the remaining oil saturation included pressure cores, conventional openhole logs, Carbon-Oxygen logs, Dielectric logs, the Nuclear Magnetism log, Thermal Decay Time logs and a Partitioning Tracer test.

18010 (CONF-810438—, pp 403-418) **Geological heterogeneities important to future enhanced recovery in carbonate reservoirs of upper Ordovician Red River formation at Cabin Creek Field, Montana. Paper SPE/DOE 9802.** Ruzyla, K.; Friedman, G.M. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

Several different pore systems are present in dolomite reservoir rocks of the Red River Formation (Upper Ordovician) at Cabin Creek Field, Montana. Each system is associated with particular depositional environments and diagenetic regimes. Pore geometry is mostly a function of the size and shape of the dolomite crystals composing the rock matrix. Mean pore-throat size, a statistical measure of pore geometry, increases as porosity percent increases, depending on type of dolomite. This relationship permits prediction of reservoir pore geometry and a better assessment of recovery efficiency, once lithofacies distribution, porosity origin, and diagenetic history have been determined for the reservoir by study of cores and rock thin sections.

18011 (CONF-810438—, pp 419-441) **Three-dimensional, randomized, network model for two-phase flow through porous media. Paper SPE/DOE 9803.** Lin, C.Y.; Slattery, J.C. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

A structural model for a porous medium in the form of a randomized, three-dimensional network is developed that can be used to calculate permeability, capillary pressure as measured under static conditions and during steady-state flows, and relative permeabilities as measured during steady-state flows. This randomized network model, expressed in terms of seven free parameters, can be employed to correlate for a given system the single-phase permeability, the drainage and imbibition capillary pressure curves, and the two drainage relative permeability curves. The subsequent portions of the hysteresis loops for capillary pressure and for the relative permeabilities then can be predicted. The limited data available from the literature for unconsolidated packed beds have been successfully correlated: 100 to 200 mesh sand and uniform 181 μm glass spheres. Data for a bed of sintered 200 μm glass beads also has been successfully described.

18012 (CONF-810438—, pp 443-454) **Scaling of flow parameters for miscible gas flood simulation studies. Paper SPE/DOE 9804.** Breit, V.S.; Graue, D.J. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

This paper outlines the steps involved in determining reasonable flow parameter values for a typical miscible gas flood simulation study using a mixing-rule type miscible flood simulator. In each step we are striving for consistency between the performance predictions of a coarse grid history matched waterflood model and a miscible gas flood model which usually requires a much finer grid. A technique is described for calculating the correct imbibition water and oil relative permeability curves to be used in a fine grid study from the set of imbibition relative permeability curves used to obtain a history match of waterflood performance with a coarse grid black oil model. These curves will assure that the fine grid model predicts the same waterflood performance as would be predicted by the history matched model. Finally, a discussion of the important considerations which must be accounted for in the selection of proper flow parameters to be used in each of the four flow regimes which occur in a typical gas flood: (1) water displacing gas behind the tertiary oil bank, (2) gas miscibly displacing oil at the back of the tertiary oil bank, (3) oil immiscibly displacing water at the leading edge of the oil bank, and (4) water displacing oil in front of the tertiary oil bank.

18013 (CONF-810438—, pp 455-469) **Planning a tertiary oil recovery project for Jay-Little Escambia Creek Fields Unit. Paper SPE/DOE 9805.** Christian, L.D.; Shirer, J.A.; Kimble, E.L.; Blackwell, R.J. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

A major tertiary oil recovery project has been approved by the Working Interest Owners at Jay to recover an additional 47 MMB of oil. Nitrogen was selected as the principal injection gas over hydrocarbon gas and carbon dioxide based primarily on cost. Initial nitrogen deliveries will begin in December 1981, and nitrogen will be injected with water at an average rate of 67 MMcf/D over the project life unitl 20% hydro-carbon pore volume (HPV) of gas has been injected. Other opportunities identified were injection of miscible gas (a) earlier using available hydrocarbon gas, (b) at higher rates by recycling produced nitrogen, and (c) for a longer period of time after reaching the planned 20% HPV. Significant findings were obtained from special laboratory and field tests which were conducted to plan this tertiary recovery project: (a) Conventional slim tube displacement tests showed that methane, nitrogen, and carbon dioxide gas are all miscible with Jay crude at reservoir conditions. (b) Oil remobilization experiments indicate that essentially all of the remaining oil in place will be recovered from reservoir rock contacted by nitrogen. (c) A field injectivity test of nitrogen-water alternating injection showed that water injectivity was reduced 40% following gas injection. The study method, which answers key uncertainties with laboratory tests, a short field test, and reservoir simulation, provided the technical support necessary to begin tertiary operations without the need for a pilot recovery test.

18014 (CONF-810438—, pp 471-488) **Gibbs energy analysis of phase equilibria. Paper SPE/DOE 9806.** Baker, L.E.; Pierce, A.C.; Luks, K.D. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

Equations of state are used to predict or match equilibrium fluid phase behavior for systems as diverse as distillation columns and miscible gas floods of oil reservoirs. The success of such simulations is dependent on correct predictions of the number and compositions of phases present at a given temperature, pressure, and overall fluid composition. For example, recent research has shown that three or more phases may exist in equilibrium in CO_2 floods. This paper shows why an equation of state can predict the incorrect number of phases or incorrect phase compositions. The incorrect phase descriptions still satisfy the usual restrictions on equality of chemical potentials of components in each phase and conservation of moles in the system. A new method and its mathematical proof are presented for determining when a phase equilibrium solution is incorrect. Examples of instances where incorrect predictions may be made are described. These include a binary system in which a two-phase solution may be predicted for a single-phase fluid, and a multicomponent CO_2/reservoir oil system in which three or more phases may coexist.

18015 (CONF-810438—, pp 489-502) **Immiscible displacement of oil by simultaneous injection of water and nitrogen. Paper SPE/DOE 9807.** Slack, W.W.; Ehrlich, R. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

Mobilization of waterflood residual oil by simultaneous injection of water and nitrogen is possible in some cases even where nitrogen and oil are immiscible and no swelling, viscosity reduction or vaporization of oil occurs. Residual oil saturation reduction is found to depend very strongly on three-phase relative permeability characteristics. For Berea sandstone, reductions of up to 18% PV were measured. Numerical simulation of water-nitrogen flooding was used to predict process performance in real reservoir geometries and to study the effects of water-nitrogen ratio, k/sub v/k/sub h/ and permeability profile. Results show that despite gravity segregation, immiscible water-nitrogen flooding is capable of recovering an appreciable fraction of waterflood residual oil at reasonable nitrogen-oil ratios and in reasonable times.

18016 (CONF-810438—, pp 503-508) **Carbon dioxide mobility control. Paper SPE/DOE 9808.** Dellinger, S.E.; Holbrook, S.T.; Patton, J.T. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

As early as 1955 surfactants were recognized for their effectiveness in lowering gas mobility in reservoir cores by in-situ foam generation. Improvements during the last fifteen years in surfactant molecular design have greatly improved foam generation in a reservoir environment. An additive selected for a specific field application must have the following characteristics: (1) high effectiveness-low cost; (2) chemically stable; and (3) unaffected by contact with crude or reservoir minerals. Tests in tight, unconsolidated sand packs show good correlation with data obtained in a static foam generator developed at New Mexico State University. This generator was used to screen over 100 candidate foaming agents. Promising additives were then ranked in two-phase linear flow tests. Some synergism exists between additives. Amine oxides and amides improve foam stability for many anionic surfactants. The utility of cosurfactant stabilization was demonstrated in linear, two-phase flow tests through tight, unconsolidated sand packs involving brine and gas. A solution containing 0.45% Alipal CD-128 and 0.05% Monomid 150-AD can decrease gas mobility over one-hundred-fold. The effect appears permanent, indicative of good foam stability.

18017 (CONF-810438—, pp 509-516) **Rheology of mobility control foams. Paper SPE/DOE 9809.** Holbrook, S.T.; Patton, J.T.; Hsu, W. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

Enhanced oil recovery studies have consistently demonstrated the need to mitigate gas channeling in processes utilizing gas to displace crude oil. The use of foam for gas mobility control was first investigated in 1955 and an early field test by Union indicated significant merit in the concept. Work at New Mexico State University was undertaken to provide rheological data of in situ generated foam in an attempt to define the mobility lowering mechanism. A capillary viscometer was constructed to measure the rheological properties of the most promising foams made with commercially available additives. Data collected at different shear rates show that foams are pseudoplastic in nature and several orders of magnitude more viscous, 10 to 100 cp (.01 to .1 Pa S) than its gas or liquid fraction. Of a special significance is the fact that foam viscosities are generally an inverse function of foam density, a fact very advantageous in oil displacement processes. In areas where gas fingering is pronounced, foam visocity would be expected to increase with gas saturation and, thereby, tend to mitigate further gas channeling. The spontaneous generation of a viscous foam phase may also serve to reduce the flowing gas saturation and, thus, lower gas mobility due to the relative permeability effect. This technology is easily adapted to the WAG process involving carbon dioxide or rich gas displacement of oil.

18018 (CONF-810438—, pp 517-530) **Elevated temperature caustic-sandstone interaction-implications for improving oil recovery. Paper SPE/DOE 9810.** Sydansk, R.D. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

Caustic in the form of sodium-hydroxide solutions is shown to strongly interact with sandstone at elevated temperature (85°C). Such interaction has a direct influence in the success of secondary and tertiary oil-recovery sodium-hydroxide floods in sandstone formations at ordinary temperatures. Caustic in the form of sodium hydroxide interacts with sandstone at elevated temperature to promote: (1) significant dissolution of the more susceptible silicate minerals, predominantly clay and large-surface-area silica minerals; (2) sandstone weight loss; (3) increased porosity; (4) propagation of significant concentrations of water-soluble silicates, including sodium orthosilicate; (5) in situ formation of new immobile aluminosilicate material; (6) changes in permeability; and (7) hydroxide-ion consumption. Caustic-sandstone interaction resulting from sodium hydroxide dissolution of silicate minerals is kinetically limited. The interaction increases with increasing temperature, increasing sodium-hydroxide concentration, and increasing caustic-sandstone contact time. The rate and amount of interaction is sensitive to sandstone mineralogy and lithology. Although not studied during this work, the presence of crude oil, along with crude-oil type, may affect the rate and amount of interaction. Based on the study of elevated temperature caustic-sandstone interaction (involving silicate-mineral dissolution), it is concluded that, at lower temperatures, the much slower dissolution interaction has implications for field application of sodium-hydroxide for improving waterflood sweep efficiency and enhancing oil recovery. Specifically, during field applications, the slow interaction could deplete the active hydroxide ions. Field application is especially susceptible because of the long caustic-sandstone contact times and because, in general, relatively small concentrations of sodium hydroxide have been historically employed.

18019 (CONF-810438—, pp 531-545) **Surfactant flooding II: the effect of alkaline additives on permeability and sweep efficiency. Paper SPE/DOE 9811.** Krumrine, P.H.; Falcone, J.S.; Campbell, T.C. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

This paper is the second of a series of papers reporting the examination of the effects alkaline additives have on dilute surfactant systems for low tension waterflooding (LTWF). The first paper in the series outlined the effects on interfacial tension, hardness removal and surfactant retention by the core material, and how these parameters then affect overall recovery of oil from watered-out cores containing high hardness brines. This study examines the effects of those chemicals on permeability, sweep efficiency, and sweep symmetry through multi-permeable zones. Correlations and possible mechanisms are offered which relate these findings to the earlier work on surfactant retention and hardness removal. The results of these studies indicate that each alkali behaves somewhat differently, but all are capable of enhancing the action of the dilute surfactant treatment. Sweep efficiency in three-dimensional radial patterns and sweep symmetry through multi-permeable zones is increased by the alkaline chemicals. Selective permeability reduction, due to reaction with the residual hardness ions, is suspected as a mechanism. Overall, sodium silicate addition to the surfactant flood as a builder was found to produce the best performance due to its ability to inhibit surfactant retention, thereby increasing the recovery of crude before selective permeability reduction occurs. Overall permeability loss is only about 20 to 25% in a core initially containing 4800 ppM of hardness as $CaCO_3$ under our experimental conditions.

18020 (CONF-810438—, pp 547-561) **Phase behavior effects on the oil displacement mechanisms of broad equivalent weight surfactant systems. Paper SPE/DOE 9812.** Gash, B.W.; Griffith, T.D.; Chan, A.F. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

A phase behavior study of micellar fluids containing vacuum gas oil (VGO) sulfonate as a function of salinity, hardness, brine dilution, temperature, cosurfactant type, and surfactant-cosurfactant ratio was used to define the region within which stable micellar fluids can be formulated. The phase behavior study demonstrates that for micellar formulations within the stable region that contain 10 wt % surfactant, the addition of an equal volume of oil (decane) normally produces Type I microemulsions (Windsor's notation). More dilute micellar fluids (1 wt % surfactant) show Type III behavior. Effluent analyses from corefloods show that VGO sulfonate

remains almost exclusively in the water phase (although a small amount of Type III microemulsion was observed in some of the effluent). This suggests that the recovery mechanism for the VGO sulfonates is dominated by the Type I lobe of a Type III phase environment. Phase behavior tests of polybutene sulfonates show that in the presence of calcium the slfonate partitions into the oil phase forming microemulsions in a Type II lobe of a Type III phase environment. During displacement tests in the presence of calcium, polybutene sulfonates partition into the oil phase generating such microemulsions in situ. The use of a Type II to Type I phase transition in moving partitioned sulfonates was investigated. Type II microemulsions generated external to the core were injected to displace the in-place oil. These were followed by a fluid designed to produce a phase transition from Type II to Type I. The Type II microemulsion miscibly displaced the in-place oil. The phase transition microemulsion flood displaced oil more efficiently at higher salinity and hardness levels than has been obtained using conventional micellar fluid formulations of VGO and polybutene sulfonates.

18021 (CONF-810438—, pp 563-575) **Development of a crude oil sulfonate (CROS) for micellar/polymer flooding of the Salt Creek Field in Natrona County, Wyoming. Paper SPE/DOE 9813.** Suffridge, F.E.; Heffern, E.W.; Valcho, J.J.; Fenoglio, D.J. (Amoco Chemicals Corp., Naperville, IL). 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

Development of a sulfonate for use in a proposed 3-acre pilot test and a potential 200-acre commercial demonstration in the Salt Creek, Second Wall Creek (WC2), reservoir is summarized. Work emphasized the development of a sulfonate manufactured from Salt Creek crude oil (CROS) or a feedstream from Amoco Oil Company's Casper refinery. Advantages of the CROS product are in its expected long-term cost advantage, consistent feedstream quality, availability of feedstream and reduced transportation cost when manufactured at or near a field location. This paper addresses the optimization and laboratory selection that went into defining the final product for more extensive fluid development studies. Experimental products were primarily evaluated upon the criteria of micellar fluid stability and the oil displacement performance of single-phase micellar fluids. Core test studies evaluated the effects of manufacturing conditions and micellar formulation variables on oil displacement. Topping (light ends removal) of the WC2 crude before sulfonation was the most significant variable affecting the salinity tolerance of the products as well as the oil displacement performance. A 35% topping level was found to be optimum. Topping beyond this level further reduced salinity tolerance and reduced the oil displacement performance. Average equivalent weights and equivalent weight distributions were determined for selected products. Typically, oil-soluble alcohol cosurfactants, such as n-hexyl alcohol or Alfonic 610-50R, improved oil displacements of CROS products. Salinities of in-place brines had little effect on the oil displacement performance over the range from about 8700 ppM TDS to about 119,000 ppM TDS in core tests.

18022 (CONF-810438—, pp 577-584) **Calcium effects in the DOE surfactant-polymer pilot test. Paper SPE/DOE 9814.** Lorenz, P.B.; Tham, M.K. (Dept. of Energy, Bartlesville, OK). 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

The surfactant and polymer slugs for the chemical recovery pilot test operated by DOE were designed to be effective at the divalent ion concentration of the injection water. Laboratory tests indicated that even if there were no intrusion by the formation brine, the slugs would experience an increase in divalent ion content on contact with the rock. It was found that with calcium present, optimal salinity of the surfactant system was reduced by 4 to 7 times the amount of calcium on an equivalent basis. The minimum interfacial tension (IFT) was raised 4-fold by 8 eq/m^3(meq/L) of calcium, but the valley was much broader. The distribution of calcium indicated that it occurred primarily in the surfactant phase. Empirical equations were developed for calculating the effect on polymer viscosity of polymer concentration, salinity, and calcium. Over a range of polymer concentrations and salinities, calcium had close to 10 times more effect on viscosity than an equivalent increase in salinity. It was found that calcium from the rock played a major role in surfactant behavior, but affected polymer behavior in only a minor way.

18023 (CONF-810438—, pp 585-592) **Criteria for structuring surfactants to maximize solubilization of oil and water I: commercial non-ionics. Paper SPE/DOE 9815.** Graciaa, A. (University of Pau, France); Fortney, L.N.; Schechter, R.S.; Wade, W.H.; Yiv, S. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

The phase behavior of nonionic surfactants having the same hydrophilic-lipophilic balance (HLB) but differing molecular weights has been studied. It is shown that the optimum alkane carbon number (ACN) depends on the HLB, but that increasing the hydrophobe molecular weight narrows the middle phase region, increases the solubilization parameter and decreases the interfacial tension. The width of the three phase region is found to be in simple inverse proportion to the solubilization parameter at optimum salinity and the multiple of the interfacial tension times and square of the solubilization is a constant. It was also found possible to synthesize nonionics which rival anionics in the above mentioned properties.

18024 (CONF-810438—, pp 593-596) **Tertiary oil recovery economics in Louisiana. Paper SPE/DOE 9817.** McCarthy, D.W. (Tulane Univ., New Orleans, LA); Groat, C.; Chen, J.K.; Weaver, R.E.C.; Aldahir, A.S. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

This paper assembles the relevant economics for the production of tertiary oil in prototype Louisiana situations. The production techniques examined and compared include carbon dioxide flooding, in-situ combustion, steam injection, and micellar/polymer flooding. A complete cost analysis is constructed for each EOR technique based specifically on reservoir properties with relevance to Louisiana.

18025 (CONF-810438—, pp 597-612) **Computer model for comparative economic analysis of enhanced oil recovery projects. Paper SPE/DOE 9818.** Cronquist, C.; Secrest, E.L.; Jones, J.W. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

A computer model has been developed for comparative analysis of EOR project economics which affords the versatility to analyze economic sensitivities for most injection sequences and economic aspects of several different types of enhanced oil recovery processes. Input of economic parameters is in terms of constant value dollars for investments and operating costs. Input of project performance is by specifying cummulative fractional oil recovery versus cummulative pore volumes of material injected. Risk can be appraised by input of three such relations, i.e., expected, good, and poor performance, each of which can be probability-weighted. Conversion to time-rate of recovery is done internally, either through input transmissibility data or user specified pore volume injection rate for each injection stage. Economic sensitivities to various input parameters are in terms of a new economic parameter, present value cost per present value barrel, which was developed in the course of this work. Project performance and economic data from Maraflood projects in Pennsylvania and Illinois were utilized to demonstrate model capability. Economic sensitivities are presented for variation in: barrels per acre-foot recovered, time rate of recovery, cost of chemical slug, cost of polymer, initial investment, and direct operating cost. The model is intended primarily for investigation of economic sensitivities to parameters like: oil in place at project initiation, recovery efficiency, transmissibility, and material-investment-operating costs. It is not intended for a stand alone evaluation of the feasibility of undertaking a specific project, although it can be used in support of programs designed to do so.

18026 (CONF-810438—, pp 613-619) **Environmental risks associated with the commercialization of enhanced oil recovery. Paper SPE/DOE 9819.** Riedel, E.F. (Battelle-Pacific Northwest Lab., Richland, WA); Garrell, M.H.; Kaplan, E.; Sathaye, J.; Bierman, G.R. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

The information collected at the workshop on Enhanced Oil Recovery (EOR) production and associated environmental risks will be used in a DOE research project to identify and evaluate potential environmental, health and safety (E, H and S) concerns associated with the production of petroleum by enhanced oil recovery. This paper presents highlights of the workshop proceedings that may be of general interest to other researchers, the oil and gas industry and government agencies. The views presented in general represent a consensus of the workshop, but they do not necessarily represent the opinions of individual workshop participants, the authors, the Department of Energy or the National Laboratories. A long list of potential environmental concerns were identified in the workshop. Only a few were felt to be potentially important: air quality, liquid waste injection, and worker health and safety considerations. Scenarios for EOR production were also reviewed and critiqued. An accurate production scenario will be required to characterize the magnitude and extent of potential E, H and S concerns from EOR production. Impediments to rapid expansin of EOR, such as lack of reservoir data, technological constraints, and economics and institutional considerations (e.g., windfall profits tax) were discussed. Accurate predictions of future EOR production levels were found to be difficult because of uncertainties in the numerous variables that might have major impacts on these levels. The potentially most significant environmental issue was found to be solid waste disposal and potential problems resulting from enforcement of the new Underground Injection Control Regulations. It was generally concluded that EOR is an environmentally safe form of increased fossil energy.

18027 **(DOE/BETC/OR—11) Chemicals for enhanced oil recovery. Biennial report, April 1978-March 1980.** Compere, A.L.; Crenshaw, J.M.; Greene, S.V.; Griffith, W.L.; Hall, J.E. Jr.; Johnson, J.S. Jr.; Jones, R.M.; Magid, L.J.; Triolo, R.; Westmoreland, C.G. (Oak Ridge National Lab., TN (USA)). Mar 1981. Contract W-7405-ENG-26. 159p. NTIS, PC A08/MF A01.

The objective of Chemicals for Enhanced Oil Recovery is to lower barriers to implementation of the micellar flood approach by decreasing cost and increasing availability of chemicals used in the process. This is done by finding alternative feedstocks in wastes or low valued organic byproducts and by development of lower cost production procedures. For biopolymers in particular, emphasis has been on developments important for field production, to obviate the expense necessary for preparation of a dry product, feasible for shipping, and of redispersion for injection into formations. Because of the large quantities of waste and low valued byproducts generated by the paper industry, wood pulping streams have received particular attention. The interests have been not only in surfactants and mobility control polymers, but also in cosurfactants, sequestering agents for control of hardness, and competitive adsorbates. Some of the highlights of this period are: microscreens compared favorably in installed cost and operating energy to diatomaceous earth filtration and centrifugation for gross biomass removal; four fungi from genera other than Sclerotium, Helotium, or Stromatinia were tested and found to be potential biopolymer producers; methods of hydrolyzing polymers sequentially from the ends were investigated, and pH and temperature optima for these were obtained; coagent alcohols and alcohol-ketone mixture were readily produced from weak acid sulfite liquor, condenser effluent, and thermomechanical effluent streams; preparations of pure sodium oleate and a number of derivatives with substituents on the carbon next to the carboxylate were carried out and their phase behavior in systems containing a fixed cosurfactant were compared as a function of alkane molecular weight and of NaCl concentration; commercial ethoxylated fatty acids of different hydrophilic/hydrophobic ratios were evaluated, both alone and in conjunction with a petroleum sulfonate surfactant.

18028 **(DOE/ET/12056—10) Laboratory combustion tube studies. Part II. Report SUPRI TR-10.** Brigham, W.E.; Fassihi, M.R.; Satman, A.; Williams, R.L.; Pettit, P.; Grim, J.; Ramey, H.J. Jr. (Stanford Univ., CA (USA). Petroleum Research Inst.). Mar 1981. Contract AC03-76ET12056. 31p. NTIS, PC A03/MF A01.

To promote a better understanding of the problems and mechanisms involved in dry in-situ combustion of crude oils in porous media, continuing laboratory studies are carried out at SUPRI. The report about the first two experiments was submitted earlier to the Department of Energy. This report describes the results of the last three tube runs. Three laboratory combustion tube studies were made with unconsolidated core material, and Lombardi Zone crude oil from the San Ardo field, California. After preparation, the material was packed into the combustion tube. Conditions employed during the steady burning phase of each run were about constant. Injection pressure for all of them was 100 Psig (6.8 Atm.). Burning front velocities ranged from 7.22 cm/hr (5.68 ft/day) to 12.96 cm/hr (10.2 ft/day) while the stream front velocities ranged from 10.4 cm/hr to 13.48 cm/hr. The air flux was between 88.33 SCF/hr-ft^2 and 122.7SCF/hr-ft^2. Observed fuel ration ranged from 162.54 SCF/lb to 169.33 SCF/lb of fuel burned. The detailed analysis of these experiments accompanied with their field application will be presented later.

18029 **(SAND—80-2843) Project DEEP STEAM preliminary field test, Bakersfield, California.** Mulac, A.J.; Beyeler, J.A.; Clay, R.G.; Darnall, K.R.; Donaldson, A.B.; Donham, T.D.; Fox, R.L.; Johnson, D.R.; Maxwell, R.L. (Sandia National Labs., Albuquerque, NM (USA)). Apr 1981. Contract AC04-76DP00789. 63p. NTIS, PC A04/MF A01.

A successful field test of the DEEP STEAM technology has been conducted. A direct contact steam generator was operated in the Kern River reservoir in cooperation with Chevron USA. The objectives of the test were demonstration of long term operation of a downhole steam generator, investigation of reservoir response, and the environmental consequences of the technology. The test was extensively instrumented to provide data on generator performance and reservoir response. The results show that the system is capable of long term operation in the oil field. It was demonstrated that substantial environmental improvements over surface steam production can be expected from injection of combustion products with steam in the downhole steam concept. The reservoir character was not altered by the test injection and appeared the same as that for pure steam injection.

18030 **Evaluating the energy-production potential of the United States Outer Continental Shelf.** Prato, A.A.; Miller, R.R. (Dept. of Energy, Washington, DC). *Land Economics ;* **57**: No. 1, 77-90(Feb 1981).

The potential for oil and gas production on federal lands leased under the new Outer Continental Shelf (OCS) leasing program is estimated using the criterion that the efficient use of nonenergy resources will be maximized. Several submodels are used in the analysis to derive production goals and a supporting five-year lease schedule. Comparisons with current and projected domestic supply, imports, and total use in various time frames indicate that accelerated OCS exploration and production will not have a significant effect on domestic energy consumption and production imbalances in the next five years. At best, it will only prevent further declines during the midterm. 22 references, 1 figure, 4 tables. (DCK)

18031 **Method for enhanced oil recovery.** Comberiati, J.R.; Kamath, K.I.; Locke, C.D. (to Department of Energy). US Patent 4,224,992. 30 Sep 1980. Filed date 30 Apr 1979. vp.

PAT-APPL-34804.

The present invention is directed to an improved method for enhanced recovery of oil from relatively "cold" reservoirs by carbon dioxide flooding. In oil reservoirs at a temperature less than the critical temperature of 87.7° F. And at a pore pressure greater than the saturation pressure of carbon dioxide at the temperature of the reservoir, the carbon dioxide remains in the liquid state which does not satisfactorily mix with the oil. However, applicants have found that carbon dioxide can be vaporized in situ in the reservoir by selectively reducing the pore pressure in the reservoir to a value less than the particular saturated vapor pressure so as to greatly enhance the mixing of the carbon dioxide with the oil.

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REFER ALSO TO CITATION(S) 18756

18032 (CONF-800483—(Vol.1), pp 345-355) **Energy guideline factors provide a better measure of refinery energy performance.** Libbers, D.D. (Exxon Co., Baton Rouge, LA). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Exxon Company, USA refineries reduced energy consumption by 25% between 1972 and 1978 compared with an 18% reduction for the US Petroleum Refining Industry over the same period. The Exxon approach to conserving energy in petroleum-refining operations goes beyond energy conservation housekeeping measures and investments, and uses a comprehensive method to measure energy efficiency rather than energy consumption per barrel. It uses the Exxon Research and Engineering developed energy-guideline factors, which are based on energy-efficient designs and criteria, to: (1) evaluate the energy-efficiency performance of refineries of different complexity in a consistent manner; (2) compensate for changes in individual process-unit throughputs and in unit-operating intensity/severity; (3) identify and quantify areas of energy inefficiency; and (4) regularly monitor and steward energy-efficiency performance. Effective conservation also requires the analysis of energy performance and setting goals for future improvement. The paper explains how this can be done.

18033 **Evaluation of materials in process equipment after long-term service in the petroleum industry.** Ciuffreda, A.R. (ed.). New York, NY; American Society of Mechanical Engineers (1979). 62p. (CONF-800204—(Vol.2)).

From Energy-sources technology conference; New Orleans, LA, USA (3 Feb 1980).

Separate abstracts were prepared for the five papers. (DLC)

0206 Health And Safety

REFER ALSO TO CITATION(S) 18026

0207 Marketing And Economics

REFER ALSO TO CITATION(S) 17976, 18024, 18025, 18037, 18756

18034 (CONF-800411—(Suppl.), pp 19-24) **Financial realities of an adequate petroleum supply.** Winger, J.G. 1980. NTIS, PC A04/MF A01.

From SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (20 Apr 1980).

As of now, the prospects for an adequate search for petroleum resources are dim. With continued price controls, there is no likelihood that the industry will have nearly enough money to finance it. Nor will phased decontrol combined with a windfall profits tax provide much more. Only with a complete decontrol is there any meaningful hope of achieving a gradual solution to the petroleum shortage. It is necessary to get a maximum amount of money employed in the search as early as possible. Although decontrol would jolt the economy, the alternative is worse. A much greater and lasting shock would be precipitated by a professively worsening shortage.

18035 **(DOE/PE/70106—T4) Markets during world oil supply crises: an analysis of industry, consumer, and governmental response.** Erfle, S.; Pound, J.; Kalt, J. (Harvard Univ., Cambridge, MA (USA). Energy and Environmental Policy Center). Apr 1981. Contract AM01-79PE70106. 193p. NTIS, PC A09/MF A01.

An analysis of the response of American markets to supply crises in world oil markets is presented. It addresses four main issues: the efficiency of the operation of American oil markets during oil supply crises; the problems of both economic efficiency and social equity which arise during the American adaptation process; the propriety of the Federal government's past policy responses to these problems; and the relationship between perceptions of the problems caused by world oil crises and the real economic natures of these problems. Specifically, Chapter 1 presents a theoretical discussion of the effects of a world supply disruption on the price level and supply availability of the world market oil to any consuming country including the US Chapter 2 provides a theoretical and empirical analysis of the efficiency of the adaptations of US oil product markets to higher world oil prices. Chapter 3 examines the responses of various groups of US oil firms to the alterations observed in world markets, while Chapter 4 presents a theoretical explanation for the price-lagging behavior exhibited by firms in the US oil industry. Chapter 5 addresses the nature of both real and imagined oil market problems in the US during periods of world oil market transition. (MCW)

18036 **(P—300-81-002) California and world oil: the strategic horizon.** (California Energy Commission, Sacramento (USA)). Jan 1981. 287p. (CONF-800796—). California Energy Commission, Sacramento.

From Symposium on California and world oil: the strategic horizon; Los Angeles, CA, USA (17 Jul 1980).

This publication contains the papers by recognized petroleum experts presented at a conference convened by the California Energy Commission to provide a world context for developing California's energy contingency plan for the 1980's. The papers are grouped into 7 categories: Middle East supplies; Third World supplies; North American supplies; world outlook; refineries; strategic policy; and a final policy discussion summary. The commission's own synthesis, including recommended actions for California, appears in Part I.

0209 Environmental Aspects

REFER ALSO TO CITATION(S) 17977, 18026, 19369

0210 Legislation And Regulation

REFER ALSO TO CITATION(S) 17974, 17975, 17980, 17981, 17982, 18752

18037 (CONF-800411—(Suppl.), pp 39-42) **Decontrol: opportunities and dangers.** Kinney, G.T. 1980. NTIS, PC A04/MF A01.

From SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (20 Apr 1980).

Decontrol on crude oil prices creates greater business opportunities. However, with the enactment of the windfall profits tax, price control to producers will continue through the indirect device of the excise tax, at least through the decade of the 80's. Thus, supply will not respond as it would under the full stimulus of the free market. Decontrol will slow the decline in oil production. But, with the excise tax draining off capital, there is no way industry can halt or reverse the decline. Most of the decontrol revenues collected from producers and consumers will go for purposes other than energy supply or conservation. Producers will get to keep only 20%. More than half will be absorbed by existing federal and state taxes and royalties. Another 23% will be captured by the excise tax. Of that 23% ($227 billion) only 15% has been earmarked for alternate energy supply. The rest will finance other government programs, directly or indirectly. After price, the second serious threat to future supply is access to acreage. The administration has made much of its supposed acceleration off shore leasing. But the increase hasn't been all that great, nor is the quality of acreage the best. All of the recent increase in fact, is of tracts rejected in previous sales. On the two great issues-incentive and access to acreage-industry and government are not yet pulling together. Industry tells one story, the government often tells another. There is a need to improve the quality of the dialog between industry and government. it is said that the excise tax would phase out eventually. However, it is difficult to imagine Congress giving up a source of revenue that has helped to balance the budget.

18038 (CONF-810438—, pp 21-27) **Jurisdictional agency certification of tertiary oil recovery projects under the windfall profits tax: the Texas approach. Paper SPE/DOE 9771.** Sullivan, B.R. 1981. NTIS, PC A99/MF A01.

From 2. joint SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (5 Apr 1981).

This article is intended to cover one area of the Crude Oil Windfall Profits Tax Act of 1980, the Qualified Tertiary Oil Recovery Projects. The Tax Act provides for the lowest tax rate of 30% on tertiary oil. This article will first cover the incremental tertiary oil portion of the Tax Act (26 USC 4993). Next it will cover the different ways of qualifying a project, the Railroad Commission's experience in handling these projects and finally some recommendations and a checklist for preparing cases.

0230 Properties

18039 **(DOE/BETC/PPS—81/1) Motor gasolines, summer 1980.** Shelton, E.M. (Department of Energy, Bartlesville, OK (USA). Bartlesville Energy Technology Center). Feb 1981. 70p. NTIS, PC A04/MF A01.

Analytical data for 2062 samples of motor gasoline were collected from service stations throughout the country and were analyzed in the laboratories of various refiners, motor manufacturers, and chemical companies. The data were submitted to the Bartlesville Energy Technology Center for study, necessary calculations, and compilation under a cooperative agreement between the Bartlesville Energy Technology Center (BETC) and the American Petroleum Institute (API). The samples represent the products of 48 companies, large and small, which manufacture and supply gasoline. These data are tabulated by groups according to brands (unlabeled) and grades for 17 marketing districts into which the country is divided. A map included in this report, shows marketing areas, districts and sampling locations. The report also includes charts indicating the trends of selected properties of motor fuels since 1949. Twelve octane distribution percent charts for areas 1, 2, 3, and 4 for unleaded, regular, and premium grades of gasoline are presented in this report. The anitknock (octane) index [(R + M)/2] averages of gasolines sold in this country were 87.8 for the unleaded below 90.0, 91.6 for the unleaded 90.0 and above, 88.9 for the regular, and 92.8 for the premium grades of gasoline.

18040 **(DOE/BETC/PPS—81/2) Aviation turbine fuels, 1980.** Shelton, E.M. (Department of Energy, Bartlesville, OK (USA). Bartlesville Energy Technology Center). Mar 1981. 14p. NTIS, PC A02/MF A01.

Properties of some aviation turbine fuels marketed in the United States during 1980 are presented in this report. The samples represented are typical 1980 production and were analyzed in the laboratories of 17 manufacturers of aviation turbine (jet) fuels. The data were submitted for study, calculation, and compilation under a cooperative agreement between the Department of Energy (DOE), Bartlesville Energy Technology Center (BETC), Bartlesville, Oklahoma, and the American Petroleum Institute (API). Results for the properties of 98 samples of aviation turbine fuels are included in the report for military grades JP-4 and JP-5 and commercial type Jet A.

0250 Combustion

REFER ALSO TO CITATION(S) 18836, 19051

03 NATURAL GAS

REFER ALSO TO CITATION(S) 18742

18041 (CONF-800483—(Vol.1), pp 199-200) **Gas-utility view of industrial energy conservation.** Loberg, T.J. (American Gas Association, Arlington, VA). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

The gas industry fostered more-efficient energy utilization long before the idea of energy conservation became fashionable. It became apparent in the late '60's that misguided Federal legislation was discouraging necessary search for new gas supplies, and the gas industry mounted a determined engineering and development effort to stretch existing supplies until changes in the legislation could be implemented. These and similar programs are ongoing even now that the outlook for new gas supplies is constantly improving. References to specific efforts by gas utilities in concert with industrial users are made.

0301 Reserves

REFER ALSO TO CITATION(S) 17969

0302 Geology And Exploration

REFER ALSO TO CITATION(S) 17971, 17972, 17973

18042 **(METC/EGSP—15) Stratigraphic cross section (B) of the Upper Devonian Perrysburg and Java Formations and their equivalents, Northwestern Pennsylvania.** Harper, J.A.; Abel, K.D. (Pennsylvania Dept. of Environmental Resources, Harrisburg (USA). Bureau of Topographic and Geologic Survey). 1981. Contract AS21-76MC05198. 25p. NTIS, PC A02/MF A01.

These cross section maps cover six locations in Crawford and Erie counties in Pennsylvania, two locations in Ashtabula County in Ohio, and one location in Chantauqua County in New York. (DLC)

18043 **(METC/EGSP—20) Stratigraphic cross section (G) of the Upper Devonian Perrysburg and Java Formations and their equivalents, Northwestern Pennsylvania.** Harper, J.A.; Abel, K.D. (Pennsylvania Dept. of Environmental Resources, Harrisburg (USA). Bureau of Topographic and Geologic Survey). 1981. Contract AS21-76MC05198. 25p. NTIS, PC A02/MF A01.

The cross sections are of the Girard D92, Girard G129, Linesville B15, Linesville I59, Stoneboro D7, Mercer A4, Mercer G3, Zelienople A9, and Zelienople F10 locations in Erie, Crawford, Mercer, Lawrence, and Butler counties in Pennsylvania. (DLC)

18044 **(METC/EGSP—21) Stratigraphic cross section (H) of the Upper Devonian Perrysburg and Java Formations and their equivalents, Northwestern Pennsylvania.** Harper, J.A.; Abel, K.D. (Pennsylvania Dept. of Environmental Resources, Harrisburg (USA). Bureau of Topographic and Geologic Survey). 1981. Contract AS21-76MC05198. 25p. NTIS, PC A02/MF A01.

The cross section maps cover eight locations in Erie, Crawford, Venango, and Clarion counties in Pennsylvania. (DLC)

18045 **(METC/EGSP—22) Stratigraphic cross section (I) of the Upper Devonian Perrysburg and Java Formations and their equivalents, Northwestern Pennsylvania.** Harper, J.A.; Abel, K.D. (Pennsylvania Dept. of Environmental Resources, Harrisburg (USA). Bureau of Topographic and Geologic Survey). 1981. Contract AS21-76MC05198. 25p. NTIS, PC A02/MF A01.

This map covers various Java, Perrysburg, and Ohio Shale Formations in the Erie, Crawford, Warren, Forest, and Clarion counties of Pennsylvania. (DLC)

18046 **(METC/EGSP—23) Stratigraphic cross section (J) of the Upper Devonian Perrysburg and Java Formations and their equivalents, Northwestern Pennsylvania.** Harper, J.A.; Abel, K.D. (Pennsylvania Dept. of Environmental Resources, Harrisburg (USA). Bureau of Topographic and Geologic Survey). 1981. Contract AS21-76MC05198. 25p. NTIS, PC A02/MF A01.

This map covers various Java, Perrysburg, and Ohio Shale Formations in Erie, Warren, and McKean counties in Pennsylvania, and in Chautauqua County in New York. (DLC)

18047 **(SAND—80-2351C) NMR determination of porosity and permeability of western tight gas sands.** Cowgill, D.F.; Pitman, J.K.; Seevers, D.O. (Sandia National Labs., Albuquerque, NM (USA); Geological Survey, Denver, CO (USA); Chevron Oil Field Research Co., La Habra, CA (USA)). 1981. Contract AC04-76DP00789. 23p. (CONF-810518—6). NTIS, PC A02/MF A01.

From Joint SPE/DOE symposium; Denver, CO, USA (27 May 1981).

Samples of fine-grained sandstone from the Colorado Interstate Gas Exploration (CIGE), Natural Buttes No. 21 core, Uinta Basin, Utah were studied using pulsed nuclear magnetic resonance (NMR) and standard mineralogical techniques. Brine-saturated rock porosities varied from 1 to 13% and were found deducible from the magnitude of the proton NMR. The complex pore geometry and presence of authigenic carbonate and clay minerals in these samples precluded the use of standard flow models for predicting brine permeabilities from T_1 decays. A network model of the pore system is proposed and shown capable of accurately reproducing measured rock permeabilities, which varied from 10^{-4} to 1 millidarcy.

0303 Drilling, Production, And Processing

REFER ALSO TO CITATION(S) 18030, 18514

0305 Health And Safety

REFER ALSO TO CITATION(S) 18050, 18051

0309 Artificial Stimulation

18048 **(DOE/MC/08385—T10) Columbia-DOE 10-well project. Technical progress report.** (Columbia Gas System Service Corp., Columbus, OH (USA)). Jan 1981. Contract AC21-78MC08385. 21p. NTIS, PC A02/MF A01.

The ten wells are located in Lorain and Trumball Counties in Ohio. Foam, liquid explosive fracturing, and cryogenic stimulations have been conducted. (DLC)

18049 **(DOE/MC/11577—T15) Small-scale experiments with an analysis to evaluate the effect of tailored pulse loading on fracture and permeability. Quarterly report No. 3, June 11-September 11, 1980.** McHugh, S.L. (SRI International, Menlo Park, CA (USA)). Oct 1980. Contract AC21-79MC11577. 66p. NTIS, PC A04/MF A01.

In Task 1, field experiments in tuff were performed at Nevada Test Site (NTS) to evaluate computational fracture predictions and to evaluate various well shooting concepts. Task 2 consists of laboratory measurements and springing experiments. In Task 3, a theoretical and computational effort, from the NAG-FRAG model, it was found that at low confining pressures (1000 psi), tensile fracturing would be the predominant mechanism for fracture damage. Pulse-shaping calculations show that: (1) different input stress histories without associated gas penetration can cause a factor of two difference in extent of fracture; (2) different input stress histories with gas penetration can cause a factor of seven or more difference in extent of fracture; and (3) gas penetration effects can substantially modify the fracture pattern resulting from the input stress pulse. A model for permeability enhancement was started this quarter. Two approaches were examined to determine the effect of pulse shaping on permeability enhancement.

0320 Transport, Pipelines, And Handling

18050 **(NTSB-PAR—80-5) Pipeline accident report: Municipal Gas Department of Cordele, Georgia, explosion and fire, Cordele, Georgia, February 21, 1980.** (National Transportation Safety Board, Washington, DC (USA). Bureau of Accident Investigation). 9 Sep 1980. 22p. NTIS.

At 11:10 am, est, on February 21, 1980, an explosion and fire destroyed four stores in a shopping complex, severely damaged an adjoining restaurant, and damaged eight cars in Cordele, Georgia. Gas leaking from a 1-in service line at 22 psig pressure migrated under a concrete block wall, into a service line trench, under a concrete slab floor, and into a jewelry store where it was ignited by an unknown source. Of the eight persons who were injured, three died later as a result of injuries received in the accident. Buildings and nearby automobiles were damaged extensively; no estimate of the dollar loss was made. The National Transportation Safety Board determines that the probable cause of the accident was the snagging, 3 days before, of a 1-in steel, gas service line by a backhoe which broke the service line in a threaded connection and also pulled it out of an underground compression coupling 14 feet away. Contributing to the accident were: (1) the failure of the Cordele municipal gas department personnel to check for additional damage to the service line or to conduct a gas leak survey after snagging the line; and (2) the failure of the gas department to inject adequate amounts of gas odorant daily in the gas distribution system to facilitate detection of escaping gas.

18051 **(NTSB-PSS—80-1) Analysis of accident data from plastic pipe natural gas distribution systems. Special study.** (National Transportation Safety Board, Washington, DC (USA). Bureau of Technology). 19 Sep 1980. 33p. NTIS.

The use of plastic materials for pipelines and fittings by the natural gas distribution industry has increased dramatically since 1965, with the major amount being a polyethylene polymer. The Safety Board completed this study to analyze accident data from both NTSB accident investigations and leak reports submitted by the industry during the years 1975 through 1978 for the purpose of determining whether any significant safety trends could be identified. The study found that there were serious shortcomings with the MTB data collection program which limit the usefulness of the data for identifying present or potential safety problems. The data deficiencies identified generally prevent the application of normal analysis tehniques to the point that only the determination of trends and inferences sufficient to focus attention on potential safety problems that require future investigation is possible. Also, the study found that the main causes of leaks in plastic pipe were breakages from outside forces, exposure to highly localized heat sources, material failures, and construction defects. In every category, the rates of failure or damage in plastic pipe were several times greater than those of equivalent steel pipe failures.

0340 Combustion

REFER ALSO TO CITATION(S) 19051

04 OIL SHALES AND TAR SANDS

0402 Site Geology And Hydrology

REFER ALSO TO CITATION(S) 17971, 18042, 18043, 18044, 18045, 18046

0403 Drilling, Fracturing, And Mining

REFER ALSO TO CITATION(S) 17928

18052 **(LA—8553-PR) Explosively produced fracture of oil shale. Progress report, April-June 1980.** Morris, W.A. (Los Alamos National Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 29p. NTIS, PC A03/MF A01.

Several intermediate-scale explosive experiments were conducted by the Los Alamos National Laboratory in the Colony Oil Shale Mine near Rifle, Colorado, during FY 1979. Each experiment is detailed giving the purpose of its design, a brief site characterization, and the initial observations of the results. Parameters, such as borehole size, explosive weight, experiment configuration, etc., were varied from one experiment to another. A summary of these parameters and the test observations are given including crater profiles. Future uses of the data are also stated. The percolation theory is used to find the critical conditions in a fracture medium at which cracks link to cause a sudden increase in permeability. The theory is shown to be useful in oil shale retorting, and possible applications to other programs are mentioned. Also, a term is introduced into the plastic yield condition for oil shale to account for the depend-

ence of the yield strength on hydrostatic pressure. The plastic flow rule is generalized, and the resulting equations are implemented in the computer code to successfully solve the problem of necking of the computational cells near the explosive charge.

18053 **(LA—8732-MS) Data from the screening of the rubble from eight cratering experiments in oil shale.** Harper, M.D.; Oliver, R. (Los Alamos Scientific Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 14p. NTIS, PC A02/MF A01.

The rubble excavated from eight cratering experiments in oil shale was separated into various piles by passing the rubble through screens of different sizes. The volumes of rubble in each screened size category are presented along with the background of the experiments. The plots of the cumulative percentage of the volume of rubble screened are also included.

18054 **(SAND—80-2686C) Dynamic fracture and fragmentation of oil shale: application of a numerical model to a blast design.** Boade, R.R.; Kipp, M.E.; Grady, D.E. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 22p. (CONF-810456—1). NTIS, PC A02/MF A01.

From 14. oil shale symposium; Golden, CO, USA (22 Apr 1981).

Portions of document are illegible.

A portion of Sandia's rock mechanics program has been directed at the study of the fracture and fragmentation properties of oil shale, with a goal of developing computational procedures for use in designing and/or evaluating blasting concepts for preparing in situ retort beds. A variety of experiments have revealed that the failure phenomenon in oil shale is highly strain-rate dependent. Data from the experiments have provided a base for a computational model for dynamic fracture and fragmentation. This model has been incorporated into a two-dimensional wavecode called TOODY and is now ready rudimentary assessments of practical blasting schemes. Such an application has recently been undertaken for a modified in-situ blasting concept which uses an array of vertically oriented explosive charges configured and sequentially detonated in decks. The charges are in boreholes drilled from a horizontal surface (floor or back) of a mined cavity. Within each deck the charges are in a square pattern. From deck-to-deck, the positions of the square patterns alternate so charges in one deck are centered with respect to charges in an adjacent deck. The computational procedures have been used to evaluate the fracturing and fragmentation that occur in the rock surrounding each charge and to determine some of the key parameters of the blast design (spacing between charges, burden thicknesses, explosive quantity requirements, etc.).

18055 **Non-linear three dimensional mechanical characterization of Colorado oil shale.** Chong, K.P. (Univ. of Wyoming, Laramie); Uenishi, K.; Smith, J.W.; Munari, A.C. *International Journal of Rock Mechanics and Mining Sciences and Geomechanics Abstracts ;* **17**: No. 6, 339-347(Dec 1980).

A comprehensive mechanical characterization program on Green River Formation oil shale from the Mahogany zone near Anvil Points, Colorado, produced prediction equations for the three-dimensional non-linear stiffness coefficients based on the organic volume and stress level as independent variables. These coefficients are useful in the mine design, fragmentation modeling, investigations directed toward creating in-place permeability, and so on. The stiffness coefficients and compressive strengths perpendicular and parallel to bedding planes are obtained from tested samples. Each sample set consists of two square prisms taken from the same horizon but cut perpendicular and parallel to bedding planes. The twelve non-zero coefficients in the stiffness matrix for oil shale are expressed in terms of the elastic constants consisting of Young's moduli and Poisson's ratios obtained from uniaxial compression tests on these square prisms. Dependency on stress levels makes it difficult to determine the coefficients by acoustical methods.

0404 Oil Production, Recovery, And Refining

REFER ALSO TO CITATION(S) 17924, 17927, 17930, 18754

18056 **(DOE/LC/01761—T2) Kerogen decomposition under elevated pressures.** Noble, R.D.; Wang, C.C. (Wyoming Univ., Laramie (USA). Dept. of Chemical Engineering). May 1981. Contract AS20-77LC01761. 60p. NTIS, PC A04/MF A01.

A series of experiments on oil shale retorting have been carried out under both isothermal and nonisothermal conditions and at different pressures. The produced shale oil was separated into five individual components: Polar, Weak Polar, Saturates, Aromatics and Olefin by applying a comprehensive analytical procedure. The effects of retorting pressure and heating rate have been studied. The oil yield under high pressure (765 kPa) is about 10% less than the oil yield under ambient pressure (78 kPa). Much of this reduced yield can be accounted for by the reduced amount of Polars formed at high pressure. 1.67×10^{-2} K/s, 6.67×10^{-2} K/s and 8.33×10^{-2} K/s heating rates have been employed in the experimental work. It was noticed that a higher rate caused a delay in the appearance of the oil. Finally, a simplified kinetic scheme which includes the distribution of liquid products and pressure effects has been proposed. The activation energies and frequency factors of generation reactions for total oil and individual components have been obtained by applying both isothermal and nonisothermal techniques.

18057 **(DOE/LC/10747—11) BX in situ oil shale project. Annual technical progress report, March 1, 1979-February 29, 1980 and quarterly technical progress report, December 1, 1979-February 29, 1980.** Dougan, P.M. (Equity Oil Co., Salt Lake City, UT (USA)). 20 Mar 1980. Contract FC20-78LC10747. 242p. NTIS, PC A11/MF A01.

During the year, design, construction and installation of all project equipment was completed, and continuous steam injection began on September 18, 1979 and continued until February 29, 1980. In the five-month period of steam injection, 235,060 barrels of water as steam at an average wellhead pressure of 1199 psig and an average wellhead temperature of 456°F were injected into the eight project injection wells. Operation of the project at design temperature and pressure (1000°F and 1500 psig) was not possible due to continuing problems with surface equipment. Environmental monitoring at the project site continued during startup and operation.

18058 **Explosive fracture studies on oil shale.** Grady, D.E.; Kipp, M.E.; Smith, C.S. (Sandia Lab, USA). *SPEJ, Society of Petroleum Engineers Journal ;* No. 5, 349-356(Oct 1980).

Fracture, fragmentation, and/or enhanced permeability through explosive methods can be difficult to achieve in the often restricted environment demanded of in-situ resource recovery methods. Blasting within confined volumes and the need for uniform fragment size and permeability adds a dimension for which a history of blasting experience is not available. Computer modeling offers a potential tool for rapid evaluation and optimization of the explosive and geometry parameters. This study deals with intermediate-scale explosive blasting tests within confined volumes that have been conducted on blocks of oil shale to evaluate a computational fracture model under realistic loading conditions. 20 refs.

18059 **(UCID—16986-80-4) Lawrence Livermore National Laboratory oil shale project. Quarterly report, October-December 1980.** Rothman, A.J. (ed.). (Lawrence Livermore National Lab., CA (USA)). Mar 1981. Contract W-7405-ENG-48. 32p. NTIS, PC A03/MF A01.

In this report, simulated modified in-situ (MIS) operations, chemical reaction studies and retort modelling are covered in detail. The MIS pilot retort studies include: runs S-23 and S-21; retort analysis by offgas data; estimated retorting rate based on inlet composition and flow rate; and carbon and sulfur balances. Chemical reaction studies cover gas-phase reactions where the rates of the water-gas shift reaction and combustion of CO and hydrocarbons were measured to develop simple kinetic schemes for gas-phase reactions in a combustion retort. Under the studies on heat of combustion, an equation was developed which relates the heat of com-

bustion of Fischer assay spent shale to its composition. Field retort operation of Rio Blanco Oil Shale Company's (RBOSC) Retort 0 run has been completed, and data are being analyzed.

18060 **(UCID—18898) Oil shale project run summary: small retort run S-19.** Ackerman, F.J.; Sandholtz, W.A.; Raley, J.H.; Carley, J.F.; Tripp, L.J. (Lawrence Livermore National Lab., CA (USA)). Apr 1981. Contract W-7405-ENG-48. 78p. NTIS, PC A05/MF A01.

Retort run S-19 was a combustion run using a 25 v% air and 75 v% steam mixture. The experiment was conducted on August 1 and 2, 1978. The added steam increased the retorting rate about 70% on both a linear and mass basis. This was accomplished largely by reducing sensible heat storage in the retorted shale. The reduced heat storage resulted in markedly reduced peak temperatures, and this in turn reduced the amount of combustion heat invested in carbonate decomposition. These heat savings then appear not only as an increased retorting rate, but also as a more efficient use of the oxygen fed to the process in terms of kerogen processed or oil produced.

18061 **(UCID—18986) In situ oil shale retorting: water quality.** Tompkins, M.A. (Lawrence Livermore National Lab., CA (USA)). 10 Mar 1981. Contract W-7405-ENG-48. 24p. NTIS, PC A02/MF A01.

Rio Blanco Oil Shale Company completed the first burn on their modified in-situ system located in the Piceance Basin of Colorado. Gas stream analyses were performed using a small computerized mass spectrometer. These analyses were made continuously from a sample line originating at the off-gas knockout drum. In addition, the feasibility of determining trace sulfur gases in this mixture was tested. The mass spectrometer has a detection limit of about 5 ppM for a typical trace component in air or other simple gas matrix. However, because of the complex organic matrix composing the oil shale gas, it becomes very difficult to positively identify most trace components at this low ppM level. The sulfur gases which have the fewest interferences include H_2S, COS, CH_3SH and SO_2. These gases can be determined at approximatey the 15 to 25 ppM level. Mass spectrometric analysis of low- or sub-ppM level trace components in complex gas mixture would require pre-treatment of the gas such as concentration or separation to be effective. Positive identifications were made on H_2S, CH_3SH, COS and SO_2. Water samples were taken from five points in the Rio Blanco MIS process for organic characterization and toxicity screening. There was considerable variation in the toxicity of the retort waters relative to both time into the burn and the location of the sampling point. The scrubber water samples were more toxic than the other samples. This is most likely due to the higher pH of these samples. The east holding pond samples were not toxic. These samples represent an integrated sample set as all process waters are finally discharged into this holding pond.

18062 **(UCRL—85279) Analysis of multiple gas-solid reactions during the gasification of char in oil-shale blocks.** Braun, R.L.; Mallon, R.G.; Sohn, H.Y. (Lawrence Livermore National Lab., CA (USA)). Apr 1981. Contract W-7405-ENG-48. 14p. (CONF-810456—2). NTIS, PC A02/MF A01.

From 14. oil shale symposium; Golden, CO, USA (22 Apr 1981).

A mathematical model is presented for the major high-temperature chemical reactions occurring in the absence of O_2 within a block of spent oil shale: decomposition of dolomite and calcite, char pyrolysis, carbon gasification with CO_2 and H_2O, water-gas shift, and intrablock diffusive and convective flow of CO_2, CO, H_2 and H_2O. To establish the validity of the computer model, experiments were performed on cylindrical blocks of oil shale having a mass of about 8 kg. The blocks were heated in an electric furnace and swept with heated gas of controllable composition that included steam. Maximum block surface temperatures of 750°C and 815°C were used. The computer model produced excellent simulations of the experimental carbon gasification reactions. Accurate simulation of the carbon gasification reactions required the use of intrinsic rate coefficients that were substantially lower than those previously measured for powdered samples. The water-gas shift had an almost negligible effect on the rate of carbon gasification in all runs.

18063 **Reverse combustion instabilities in tar sands and coal.** Gunn, R.D.; Krantz, W.B. (US DOE). *SPEJ, Society of Petroleum Engineers Journal ;* **20**: No. 4, 267-277(Aug 1980).

A linear stability analysis shows that reverse combustion in coal and tar sands is unstable for most operating conditions and, thus, will tend to form combustion channels. The combustion channel diameter is found to increase with increasing air injection velocity, thus maintaining a nearly constant air flux in the combustion channels. 16 refs.

18064 **Analysis of variables for process control of commercial modified in-situ retort operations for high yield.** Galloway, T.R. (Lawrence Livermore Lab, Calif). *In Situ ;* **4**: No. 3, 237-260(1980).

Recent results from experiments on the LLL 1/8- and 6-Mg pilot-scale oil-shale retorts have provided new insight into the key oil-loss mechanisms and have suggested a number of practical process-control means for maximizing in situ retort yields. Steam or water mist, total flow, and oxygen flux are valuable process-control knobs in controlling the maximum bed temperatures below 950/degree/C. Shale beds containing a broad size range (i.e., 30-cm to 10-/mu/m particles) were found to retort with lower yields than beds with smaller particles in narrow size ranges. 18 refs.

0405 Properties And Composition

REFER ALSO TO CITATION(S) 18056, 19051

18065 **Quantitative study of the carboxylic acids in green river oil shale bitumen.** Vandegrift, G.F.; Winans, R.E.; Scott, R.G.; Horwitz, E.P. (Argonne Natl Lab, Ill). *Fuel. A Journal of Fuel Science ;* **59**: No. 9, 627-633(Sep 1980).

Bitumen fractions were extracted by a benzene/methanol reflux of Green River oil shale (GROS) before and after treatment with HCl, HF, and HCl/HF. Acid leaching released 80% more bitumen than could be extracted without acid treatment. This additional bitumen had greater concentrations of carboxylic acids and their salts than the untreated oil shale bitumen. Bitumen fractions were collected and studied before and after each leaching. The identities and amounts of carboxylic acids released were studied by gas chromatography-mass spectrometry. 16 refs.

18066 **Treatment of Green River oil shale by carbon dioxide and water: evidence for association of bitumen and carbonate materials.** Vandegrift, G.F.; Winans, R.E.; Horwitz, E.P. (Argonne Natl Lab, Ill). *Fuel. A Journal of Fuel Science ;* **59**: No. 9, 634-636(Sep 1980).

The use of CO/sub 2/ under pressure to disaggregate the mineral matrix of Green River oil shale has been studied. The degree of disaggregation was measured by changes in particle size distribution and the amount and constituency of the bitumen released after treatment. Although the effectiveness of this technique was minimal, it did afford greater insight into the physical and chemical characteristics of Green River oil shale. 3 refs.

0407 Health And Safety

REFER ALSO TO CITATION(S) 19320, 19370, 19371, 19372

0410 Enviromental Aspects

REFER ALSO TO CITATION(S) 17939, 18061, 19370

18067 **(LA—8506-PR) Assessment and control of water contamination associated with shale oil extraction and processing. Progress report, October 1, 1978-September 30, 1979.** Wagner, P.; Peterson, E.J.; Wanek, P.L. (Los Alamos Scientific Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 51p. NTIS, PC A04/MF A01.

An integrated assessment of environmental control technologies applicable to shale oil development is reported. Air quality, water quality, potential surface disruption, potential problem areas, and research needs have been assessed, and finally, environmental

control technologies have been indicated. The experimental program attempts to identify mechanisms and kinetics of trace element release from raw and spent shales, the effects of these releases on water quality, and methods for control of potential contaminants. Our study emphasizes the nature, extent, transport, and fate of contaminants occurring as waste and as an effect of retort parameters. Our experiments confirmed that concentrations of soluble species in product waters, laboratory-generated leachates, and natural water systems are controlled by the variables mentioned. Although preliminary experiments have pointed to some concerns as yet unresolved and have indicated the difficulty of developing an integrated environmental control technology, a complete information and data base must be developed to avoid premature judgments based on these incomplete findings.

05 NUCLEAR FUELS

0501 Reserves

REFER ALSO TO CITATION(S) 18073

18068 **(GJBX—5(81)) Geology and recognition criteria for veinlike uranium deposits of the lower to middle Proterozoic unconformity and strata-related types. Final report.** Dahlkamp, F.J.; Adams, S.S. (Adams (Samuel S.) and Associates, Boulder, CO (USA)). Jan 1981. Contract AC13-76GJ01664. 319p. NTIS, PC A14/MF A01.

The discovery of the Rabbit Lake deposit, Saskatchewan, in 1968 and the East Alligator Rivers district, Northern Territory, Australia, in 1970 established the Lower-Middle Proterozoic veinlike-type deposits as one of the major types of uranium deposits. The term veinlike is used in order to distinguish it from the classical magmatic-hydrothermal vein or veintype deposits. The veinlike deposits account for between a quarter and a third of the Western World's proven uranium reserves. Lower-Middle Proterozoic veinlike deposits, as discussed in this report include several subtypes of deposits, which have some significantly different geologic characteristics. These various subtypes appear to have formed from various combinations of geologic processes ranging from synsedimentary uranium precipitation through some combination of diagenesis, metamorphism, metasomatism, weathering, and deep burial diagenesis. Some of the deposit subtypes are based on only one or two incompletely described examples; hence, even the classification presented in this report may be expected to change. Geologic characteristics of the deposits differ significantly between most districts and in some cases even between deposits within districts. Emphasis in this report is placed on deposit descriptions and the interpretations of the observers.

18069 **(GJBX—6(81)) National uranium resource evaluation. Geology and recognition criteria for sandstone uranium deposits of the salt wash type, Colorado Plateau Province. Final report.** Thamm, J.K.; Kovschak, A.A. Jr.; Adams, S.S. (Thamm, Mickle and Co., Grand Junction, CO (USA); Union Carbide Corp., Grand Junction, CO (USA); Adams (Samuel S.) and Associates, Boulder, CO (USA)). Jan 1981. Contract AC13-76GJ01664. 135p. NTIS, PC A07/MF A01.

The uranium-vanadium deposits of the Salt Wash Member of the Morrison Formation in the Colorado Plateau are similar to sandstone uranium deposits elsewhere in the USA. The differences between Salt Wash deposits and other sandstone uranium deposits are also significant. The Salt Wash deposits are unique among sandstone deposits in that they are dominantly vanadium deposits with accessory uranium. The Salt Wash ores generally occur entirely within reduced sandstone, without adjacent tongues of oxidized sandstone. They are more like the deposits of Grants, which similarly occur in reduced sandstones. Recent studies of the Grants deposits have identified alteration assemblages which are asymmetrically distributed about the deposits and provide a basis for a genetic model for those deposits. The alteration types recognized by Shawe in the Slick Rock district may provide similar constraints on ore formation when expanded to broader areas and more complete chemical analyses.

18070 **(GJBX—79(81)) Survey of lands held for uranium exploration, development, and production in fourteen western states in the six-month period ending December 31, 1980.** (Bendix Field Engineering Corp., Grand Junction, CO (USA)). Apr 1981. Contract AC13-76GJ01664. 23p. NTIS, PC A02/MF A01.

The statistics set forth for the period covered in this report are based on data gathered from records available to the public. The county records of mining claim locations, reports of state and federal land offices, and commercial reporting services furnish the data for this report.

18071 **(PNL—3595) Probabilistic estimates of US uranium supply.** Piepel, G.F.; Long, L.W.; McLaren, R.A.; Ford, C.E. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Feb 1981. Contract AC06-RL01830. 127p. NTIS, PC A07/MF A01.

This report develops and presents probabilistic estimates of total US uranium supply. The word supply is used in the broad sense that both uranium quantity and cost are of interest. Cost implies minimum acceptable selling price rather than market price. Specifically, four types of probability distributions are developed: (1) quantity of US uranium; (2) cost of US uranium; (3) quantity of US uranium available at or below a certain cost; and (4) cost of US uranium given a certain consumption. In this report, uranium refers to recoverable U_3O_8 (endowment adjusted for mining recovery and milling losses) occurring in both reserve and potential deposits meeting minimum size requirements with minimum grade above 0.01%. Cost includes operating and capital costs, taxes, profit, and cost capital. This definition of cost is often used to better denote this meaning. This definition of cost is contrasted with forward costs, that exclude sunk costs, taxes, and return on investment. Consumption refers to uranium that has been used from the current time to any point in the future. Uranium quantity and consumption are expressed in short tons, while full recovery costs are stated in constant 1980 dollars per pound.

0502 Exploration

REFER ALSO TO CITATION(S) 19018, 19160, 19412

18072 **(GJBX—7(81)) Summary geologic report on the Missoula/Bitterroot Drilling Project, Missoula/Bitterroot Basins, Montana.** Abramiuk, I.N. (comp.). (Bendix Field Engineering Corp., Grand Junction, CO (USA)). Aug 1980. Contract AC13-76GJ01664. 146p. NTIS PC E05/MF $3.95.

Includes 12 sheets of 24x reduction microfiche.

The objective of the drilling project was to obtain information to assess the favorability of the Tertiary sedimentary units in the Missoula and Bitterroot Valleys for uranium potential. The group of Montana Tertiary basins, including the Missoula and Bitterroot Basins, has been assigned a speculative uranium potential of 46,557 tons of U_3O_8 at $100/lb by the 1980 National Uranium Resource Evaluation report. The seven drill holes, two in the Missoula Valley and five in the Bitterroot Valley, verified observations made during surface studies and provided additional information about the subsurface that was previously unknown. No uranium was found, although of the two localities the Bitterroot Valley is the more favorable. Three stratigraphic units were tentatively identified on the basis of lithology: pre-Renova clastic units, Renova Formation equivalents, and Sixmile Creek Formation equivalents. Of the three, the Renova Formation equivalents in the Bitterroot Valley appear to be the most favorable for possible uranium occurrences and the pre-Renova clastic units the least favorable.

18073 **(GJBX—33(81)) Uranium potential in Precambrian conglomerates of the Central Arizona Arch. Final report.** Anderson, P.; Wirth, K.R. (Wallaby Enterprises, Tucson, AZ (USA)). Jan 1981. Contract AC13-76GJ01664. 340p. NTIS, PC E12/MF $4.10.

Includes 11 sheets of 24 reduction microfiche.

The Precambrian quartz-pebble conglomerates in a 9500 km^2 area of central Arizona between the Mazatzal and Sierra Ancha Mountains were investigated for the presence of significant uranium concentrations or environments favorable for uranium concentra-

tion. Abundant conglomerates are found in either the 1740 to 1720 m.y.-old Alder Group, the 1700 m.y.-old Mazatzal Group, or the 1300 to 1250 m.y.-old Apache Group. Supplementing detailed geologic study of the conglomerates is a systematic analysis of major-element, trace-element, and uranium-geochemical data for over 300 rock samples. This analysis provides a relationship between scintillometer data and uranium content for different rock types and gives correlation coefficients between uranium and related metals in the heavy-mineral assemblage. A radiometric variance plot of averages for the various conglomerate types shows that Apache Group conglomerates are Th-rich and too evolved, marine Mazatzal and Alder conglomerates are U-poor, whereas only high-energy fluvial environments in basal Deadman and Mazatzal conglomerates strongly concentrated uranium values. Reevaluation of accepted criteria for uranium concentration in Precambrian quartz-pebble conglomerates in light of new data on uranium-mineral stability under nonreducing conditions and new observations on major world deposits leads to the conclusion that the presence of a U-rich source terrain is singularly the most important factor in finding a conglomeratic uranium deposit. Most Precambrian conglomerates of the world contain depositional environments and heavy mineral concentrates conducive to uranium concentration, but insufficient uranium is present in the source. The reason pyritic, carbonaceous siltstones in the Apache Group of central Arizona contain strata-bound uranium deposits is that a nearby U-rich source of high K_2O rhyolitic volcanism was available during deposition of the siltstones.

18074 **(GJBX—94(81)) Aerial gamma ray and magnetic survey: Louisville quadrangle, Indiana, Ohio, and Kentucky. Final report.** (EG and G GeoMetrics, Sunnyvale, CA (USA)). Mar 1981. Contract AC13-76GJ01664. 272p. NTIS, PC E09/MF $3.65.

Includes 8 sheets of 48x reduction microfiche.

The Louisville quadrangle of Kentucky, Ohio and Indiana covers 7250 square miles of the Midwestern Physiographic Province. Thin Paleozoic strata overlie Precambrian basement over most of the area. Quaternary glacial sediments cover some of the Paleozoic sediments in the northeast and northwest. No known uranium deposits occur in the area. Statistical analysis of the radiometric data revealed 90 anomalies. All appear to have cultural associations, but one well-defined group of anomalies have obviously higher uranium concentrations relative to the balance of anomalies in the quadrangle, and are closely associated with the New Albany Shale. These few anomalies are considered significant and suggest that more detailed local resource studies should concentrate in this area. Magnetic data appear to suggest complexities in the Precambrian. No clear structural relationships with the Paleozoic strata can be seen.

18075 **(GJBX—98(81)) Aerial radiometric and magnetic survey: Grangeville National Topographic Map, Idaho, Oregon, and Washington. Rockies wrap-up project. Final report.** (Geodata International, Inc., Dallas, TX (USA)). 1981. Contract AC13-76GJ01664. 289p. NTIS, PC E12/MF $12.95.

Includes 70 sheets of 48x reduction microfiche.

The results of analyses of the airborne gamma radiation and total magnetic field survey flown for the region identified as the Grangeville National Topographic Map NL11-8 are presented. The airborne data gathered are reduced by ground computer facilities to yield profile plots of the basic uranium, thorium and potassium equivalent gamma radiation intensities, ratios of these intensities, aircraft altitude above the earth's surface, total gamma ray and earth's magnetic field intensity, correlated as a function of geologic units. The distribution of data within each geologic unit, for all surveyed map lines and tie lines, has been calculated and is included. Two sets of profiled data for each line are included, with one set diplaying the above-cited data. The second set includes only flight line magnetic field, temperature, pressure, altitude data plus magnetic field data as measured at a base station. A general description of the area, including descriptions of the various geologic units and the corresponding airborne data, is included also.

18076 **(GJBX—100(81)) Aerial gamma ray and magnetic survey: Valdosta and Jacksonville quadrangles, Georgia and Florida. Final report.** (EG and G GeoMetrics, Sunnyvale, CA (USA)). Mar 1981. Contract AC13-76GJ01664. 396p. NTIS, PC E13/MF $4.40.

Includes 12 sheets of 48x reduction microfiche.

The combined Valdosta and Jacksonville quadrangles cover 10,912 square miles of land in southeastern Georgia and northeastern Florida. The area includes moderately thick sections of platform sediments covering the pre-Cretaceous Peninsular Arch. Surficial exposures are comprised of Tertiary to Recent deposits. A search of available literature revealed no known significant uranium deposits. Forty-three uranium anomalies were detected and are discussed briefly in this report. None appear to be of significance. Magnetic data appear to largely reflect known structure. Smaller linear features present could represent complexities in the Paleozoic and older basement material.

18077 **(GJBX—101(81)) Aerial gamma ray and magnetic survey: Gainesville and Daytona Beach quadrangles, Florida. Final report.** (EG and G GeoMetrics, Sunnyvale, CA (USA)). Mar 1981. Contract AC13-76GJ01664. 340p. NTIS, PC E12/MF $4.40.

Includes 12 sheets of 48x reduction microfiche.

The Gainesville and Daytona Beach quadrangles cover 9250 square miles of land in north-central Florida. The area includes moderately thick sections of platform sediments covering the pre-Cretaceous Peninsular Arch. Surficial materials are composed of Tertiary or more recent deposits. A search of available literature revealed no known significant uranium deposits. Sixty-four uranium anomalies were detected and are discussed briefly in this report. All appear to be related to culture. One well-defined group of anomalies appear to have higher uranium concentrations and are closely associated with the Hawthorne Formation. These few anomalies are considered significant and suggest that more detailed local resource studies should concentrate in this area. Magnetic data appear to suggest complexities in the Paleozoic and older basement material. While some linear features appear related to known diabase dikes, several isolated features are not accounted for by known information.

18078 **(GJBX—102(81)) Aerial gamma ray and magnetic survey: West Palm Beach quadrangle, Florida. Final report.** (EG and G GeoMetrics, Sunnyvale, CA (USA)). Mar 1981. Contract AC13-76GJ01664. 227p. NTIS, PC E09/MF $3.80.

Includes 10 sheets of 48x reduction microfiche.

The West Palm Beach quadrangle of south peninsular Florida, covers 8300 square miles of predominantly Floridan Everglades. Extremely thick platform deposits overlie the pre-Cretaceous Peninsular Arch. Surficial exposures are entirely Miocene to Recent in age. A search of available literature revealed no economically feasible uranium deposits. Thirty-two uranium anomalies were detected and are discussed briefly in this report. All appear to have cultural associations, and none appear to contain significant measured quantities of uranium. Magnetic data appear to be roughly in agreement with present structural interpretations, but suggest some lithologic and/or structural complexities in the Paleozoic and older basement material.

18079 **(GJBX—103(81)) Aerial gamma ray and magnetic survey: Waycross and Brunswick quadrangles, Georgia. Final report.** (EG and G GeoMetrics, Sunnyvale, CA (USA)). Mar 1981. Contract AC13-76GJ01664. 405p. NTIS, PC E13/MF $5.00.

Includes 16 sheets of 48x reduction microfiche.

The Waycross and Brunswick quadrangles cover approximately 11,000 square miles of land in southeast Georgia. The area overlies moderately thick sections of the Southeast Georgia Basin. Surficial exposures are entirely Tertiary to Recent deposits. A search of available literature revealed no known significant uranium deposits. Fifty-eight uranium anomalies were detected and are discussed briefly. None were considered significant and all appear to be related to cultural features. Magnetic data poorly reflects existing structural interpretation. Numerous linear and isolated high gradient features dominate the area, and appear to express complexities in the Paleozoic and older basement material.

18080 **(GJBX—104(81)) Aerial gamma ray and magnetic survey: Tarpon Springs and Orlando quadrangles, Florida. Final report.** (EG and G GeoMetrics, Sunnyvale, CA (USA)). Apr 1981. Contract AC13-76GJ01664. 352p. NTIS, PC E14/MF $9.80.

Includes 10 sheets of 48x reduction microfiche.

The Tarpon Springs and Orlando quadrangles cover 7850 square miles of central peninsular Florida. Cretaceous and younger platform deposits overlie a complex core of Precambrian, Paleozoic and early Mesozoic crystalline rocks and sediments. Tertiary and Quaternary platform deposits and alluvium cover the surface. Extensive mining for phosphates is taking place in certain areas of the two quadrangles. No known uranium deposits are present within the quadrangles, but the phosphates are known to contain higher than normal amounts of uranium. Statistical analysis resulted in the selection of 47 anomalies. All appear to be related to culture, but some that are associated with the phosphate region have extremely high apparent uranium values. Detailed resource study should concentrate on the phosphates and on the possibility of uranium recovery as a by-product of phosphate mining.

18081 **(GJQ—009(81)) National uranium resource evaluation: Williams quadrangle, Arizona.** O'Neill, A.J.; Nystrom, R.J.; Thiede, D.S. (Bendix Field Engineering Corp., Grand Junction, CO (USA). Grand Junction Operations). Mar 1981. Contract AC13-76GJ01664. 139p. NTIS, PC E05/MF $3.50.

Includes 4 sheets of 24x reduction microfiche.

Geologic environments of the Williams Quadrangle, Arizona, were evaluated for uranium favorability by means of literature research, uranium-occurrence investigation and other surface studies, subsurface studies, aerial radiometric data, hydrogeochemical data, and rock-sample analytic data. Favorability criteria are those of the National Uranium Resource Evaluation program. Three geologic environments are favorable for uranium: the Tertiary fluvial rocks of the Colorado Plateau where they unconformably overlie impermeable bed rock (for channel-controlled peneconcordant deposits); collapse breccia pipes in Paleozoic strata of the Colorado Plateau (for vein-type deposits in sedimentary rocks); and Precambrian crystalline rocks of the Hualapai, Peacock, and Aquarius Mountains, and Cottonwood and Grand Wash Cliffs (for magmatic-hydrothermal deposits). Unfavorable geologic environments are: Tertiary and Quaternary volcanic rocks, Tertiary and Quaternary sedimentary rocks of the Colorado Plateau, nearly all Paleozoic and Mesozoic sedimentary rocks, and the Precambrian-Cambrian unconformity of the Grand Wash Cliffs area. Tertiary rocks in Cenozoic basins and Precambrian crystalline rocks in the Grand Canyon region and in parts of the Aquarius Mountains and Cottonwood and Grand Wash Cliffs are unevaluated.

0504 Feed Processing

REFER ALSO TO CITATION(S) 18119

18082 **(UCRL-Trans—11677) Process for the extraction of heavy metals dissolved in seawater.** Heitkamp, D.; Wagener, K. (Lawrence Livermore National Lab., CA (USA)). Feb 1981. Translation of German Patent 2,711,609, 21 Sep 1978. 26p. NTIS, PC A03/MF A01.

A process is claimed for the extraction of heavy metals, particularly uranium, which are dissolved in seawater. The heavy metals are concentrated by adsorption on a matrix material of natural black peat. The procedure involves the following steps: adsorber matrix of black peat containing a biologically recent humic acid and having a maximum of 99% by weight of material serving as the carrier material for the humic acid is placed in contact with seawater until as high a proportion as possible of heavy metals are adsorbed; adsorber matrix is removed from seawater and the heavy metals are extracted with dilute hydrochloric acid which is made by the electrolytic decomposition of sodium chloride in the seawater; the extract is adjusted to a pH range of 4 to 8 with sodium hydroxide which is also prepared by the electrolytic decomposition of sodium chloride in the seawater; the eluate is treated again with an adsorber matrix containing humic acid for further concentration of the heavy metals, and the metals are finally processed off as metal salts.

0507 Fuels Production And Properties

REFER ALSO TO CITATION(S) 18125, 19013

18083 **Sphere-cal process: fabrication of fuel pellets from gel microspheres.** Tiegs, S.M. (Oak Ridge National Lab., TN). Contract W-7405-ENG-26. *American Ceramic Society Bulletin ;* **59**: No. 11, 1156-1157(Nov 1980).

Based on sphere-cal results, the gel-sphere preparation conditions were modified to improve the gel-sphere properties as they related to pellet fabrication. The best sphere-cal results were obtained with opaque microspheres with a diameter 50 to 400 μm in the dried state. The preferred gelation conditions yielded dried spheres with larger crystallite size (≅ 15 nm) and lower BET surface area (≅ 10 m^2/g).

18084 **Chemical flowsheet conditions for preparing urania spheres by internal gelation.** Haas, P.A.; Begovich, J.M.; Ryon, A.D.; Vavruska, J.S. (Oak Ridge Natl Lab, Tenn). *Industrial and Engineering Chemistry, Product Research and Development ;* **19**: No. 3, 459-467(Sep 1980).

Small, ceramic urania spheres can be prepared for use as nuclear fuel by internal chemical gelation of uranyl nitrate solution droplets. Acid-deficient uranyl nitrate solutions up to 3.4 M in uranium with NO_3^-U mole ratios of 1.5 to 1.7 are prepared by dissolution of U_3O_8 or UO_3. Decomposition of hexamethylenetetramine dissolved in the uranyl nitrate solution releases ammonia to precipitate hydrated UO/sub 3/. Previously established flowsheet conditions have been improved and modified at ORNL and have been applied to prepare dense UO_2 spheres with average diameters of 1200,, 300, and 30 μm. The 1200- and 300-μm UO_2 spheres were prepared by gelation in trichloroethylene at 50 to 65°C; 2-ethyl-1-hexanol was used as the gelation medium to prepare 30-μm UO_2 spheres. 8 refs.

0508 Spent Fuels Reprocessing

REFER ALSO TO CITATION(S) 18091, 18094, 18122

0509 Transport And Storage

REFER ALSO TO CITATION(S) 18124

18085 **(DOE/NV/00597—1) Evaluation of weldment sensitization on Type 304 and 304L stainless steel spent-fuel canisters.** Filippio, A.M. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Advanced Energy Systems Div.). Jan 1980. Contract AC08-76NV00597. 77p. NTIS, PC A05/MF A01.

Sensitization was evaluated on welded Type 304 and 304L stainless steel canisters produced for the Commercial Waste Spent Fuel Packaging Program (CWSFPP) and the Nevada Nuclear Waste Storage Program (NNWSP). The canister weldments which were made under conditions having the greatest potential for causing sensitization were examined using metallographic and corrosion test practices described in Specification ASTM A-262, and also by exposure to hypothetical conditions simulating continuous boiling water immersion at the storage sites. When tested to ASTM A-262, the Type 304 weldments displayed classical evidence of sensitization; i.e., loss of corrosion resistance at heat affected zones, but no evidence of sensitizations was uncovered on the Type 304L weldments. Both the Type 304 and 304L weldments were totally unaffected by exposure for 1500 hours under conditions of continuous boiling water immersion, indicati_ that the CWSFPP and NNWSP canisters have adequate corrosion resistance for the intended applications.

18086 **(UCID—18840) Finite-element calculations of near-field transient horizontal temperature and thermal stress distributions for the Climax granite nuclear spent-fuel-storage experiment.** Greenlaw, R.C. (California Univ., Livermore (USA). Lawrence Livermore Lab.). Mar 1980. Contract W-7405-ENG-48. 47p. NTIS, PC A03/MF A01.

Calculations of near-canister temperature and thermal stress fields in a horizontal plane through a typical spent nuclear fuel canister in the Climax granite experiment are presented, assuming homogeneity of the rock mass. The methodology is described. Three different canister spacings were investigated. The resulting temperature and stress plots show that a row of canisters may be satisfactorily approximated by a distributed plane source for points of interest which are at greater distances from the row than the canister spacing. Further, the thermal tensile stress changes are trivial and very much less than the calculated residual horizontal geostatic compressive stresses. A listing of the mesh-generator input is given for use in additional analyses.

18087 **(UCRL—85768) Geomechanics of the Climax mine-by, Nevada Test Site.** Heuze, F.E. (Lawrence Livermore National Lab., CA (USA)). Mar 1981. Contract W-7405-ENG-48. 8p. (CONF-810624—4). NTIS, PC A02/MF A01.

From 22. US symposium on rock mechanics; Cambridge, MA, USA (29 Jun 1981).

A generic test of retrievable geologic storage of spent fuel assemblies in an underground chamber is being conducted at the Nevada Test Site. The horizontal shrinkage of the pillars is not explainable, but the vertical pillar stresses are easily understood. A two-phase project was initiated to estimate the in-situ deformability of the Climax granite and to refine the in-situ stress field data, and to model the mine-by. (DLC)

18088 (SAND—80-2577(Vol.2)(Pt.2), pp 741-744) **Appendix EE: 1979 subseabed disposal transportation.** Allen, G.C. Jr. Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 2 of 2.

The objective of the transportation activities is to ensure that operational hardware for transporting waste is designed, licensed, fabricated, tested, and available for use in a manner that is consistent with the overall objective of the subseabed disposal program. During 1979, the subseabed disposal transportation program plan was completed. This plan defines those transportation activities required over the next five years in order to successfully initiate Title 1 design in 1985. Additionally, the program plan identifies specific deliverables in the subseabed disposal transportation activities.

18089 **Nuclear capacity projections and spent fuel accumulation.** Park, U.Y.; Yates, K.R. (Battelle, Columbus Lab, Ohio). *Power Engineering ;* **83**: No. 12, 64-65(Dec 1979).

A reasonable projection of commercial nuclear power growth in the U.S. is presented. This estimate is based on what appears possible for the utilities to achieve under the influences that prevail at the moment. Spent fuel accumulation is projected on this same basis. By 1985, there will be 3460 metric tons heavy metal (MTHM) of spent fuel discharged, and a cumulative total of 21,600 MTHM. This amount will increase by 13%/yr to reach 56,000 MTHM by 1993, and by 7%/yr from then to 2000.

0520 Waste Management

REFER ALSO TO CITATION(S) 18087, 18088, 18113, 18114, 18115, 18117, 18990, 18993, 19013, 19016, 19020, 19196, 19228, 19241, 19242, 19243, 19244, 19384, 19386, 19395, 19396, 19399, 19400, 19401, 19402, 19403, 19404, 19406, 19407, 19414, 19415, 19416, 19417, 19418, 19419, 19420, 19421, 19422, 19423

18090 **(DOE/ET/41900—4) Radiation and transmutation effects relevant to solid nuclear waste forms.** Vance, E.R.; Roy, R.; Pillay, K.K.S. (Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group). 15 Mar 1981. Contract AC09-79ET41900. 35p. (ESG-DOE—13340). NTIS, PC A03/MF A01.

Radiation effects in insulating solids are discussed in a general way as an introduction to the quite sparse published work on radiation effects in candidate nuclear waste forms other than glasses. Likely effects of transmutation in crystals and the chemical mitigation strategy are discussed. It seems probable that radiation effects in solidified HLW will not be serious if the actinides can be wholly incorporated in such radiation-resistant phases as monazite or uraninite.

18091 **(DOE/ET/44207—1) West Valley feasibility study.** Pirro, J. (Burns and Roe Industrial Services Corp., Paramus, NJ (USA)). Jan 1981. Contract AC02-80ET44207. 573p. NTIS, PC A24/MF A01.

This report presents the results of a technical assessment of decontamination alternative prepared for the Western New York Nuclear Service Center (WNYNSC). The purpose of the assessment is to determine the recommended method for decontamination of cell surfaces and decontamination and removal of fuel reprocessing cell equipment to permit manual entry into the cells for the installation of waste solidification equipment. The primary cells of interest are the PMC, GPC, and CPC because they offer the largest usable volume for the solidification program. The secondary cells include XC-1, XC-2, XC-3 and the PPC which may be needed to support the solidification program. Five decontamination assessments were evaluated (A-E). The assessments included the estimated cost, occupational exposure, duration, manpower, waste volume generated, and final cell radiation levels achieved with the alternative decontamination methods. The methods varied from thorough destructive decontamination to equipment removal without decontamination followed by cell wall and floor decontamination. The recommended method for the primary cells is to utilize the remote manipulators and cranes to the maximum extent possible to decontaminate equipment and cell surfaces remotely, and to remove the equipment for temporary on-site storage. The recommended method for secondary cell decontamination is to remotely decontaminate the cells to the maximum extent possible prior to manned entry for contact-removal of the fuel reprocessing equipment (Assessment D). Assessment A is expected to cost $8,713,500 in 1980 dollars (including a 25% contingency) and will result in an occupational exposure of 180.3 manRem. Assessment D is expected to cost $11,039,800 and will result in an occupational exposure of 259 manRems.

18092 **(DOE/ET/44207—2) Cost estimates supporting West Valley DEIS.** Pirro, J. (Burns and Roe Industrial Services Corp., Paramus, NJ (USA)). Jan 1981. Contract AC02-80ET44207. 47p. NTIS, PC A03/MF A01.

An Environmental Impact Statement (EIS) is being prepared which considers alternate means for solidifying the high level liquid wastes (HLLW) at the Western New York Nuclear Service Center (WNYNSC). For this purpose three basic scenarios were considered. In the first scenario, the HLLW is converted into terminal waste form of borosilicate glass. Before vitrification, the non-radioactive chemical salts are separated from the radioactive and transuranic (TRU) constituents in the HLLW. In the second scenario, the HLLW is converted into an intermediate form-fused salt. The stored HLLW is dewatered and melted and the solids are transported to a Department of Energy (DOE) site. The fused salt will be processed of the DOE site at a later date where it will be converted to a vitrified form in a facility that will be constructed to treat HLLW stored at that site. The vitrified salt will be eventually removed for permanent disposal at a Federal repository. In the third scenario, the HLLW is solidified in the existing HLLW storage tanks with cement and returned for on-site disposal in the existing tanks or additional tanks as needed to accommodate the volume. To support the EIS, the costs to accomplish each of the alternatives is provided. The purpose of this cost estimate is to provide a common basis to evaluate the expenditures required to immobilize the HLLW presently stored at the WNYNSC. (DMC)

18093 **(ONWI—70) Characterization of samples of a cement-borehole plug in bedded evaporites.** Scheetz, B.E.; Grutzeck, M.W.; Wakeley, L.D.; Roy, D.M. (Pennsylvania State Univ., University Park (USA). Materials Research Labs.). Jul 1979. Contract AC06-76RL01830. 69p. NTIS, PC A04/MF A01.

This report describes the laboratory characterization of a section of an eighteen-year-old cement-based plug emplaced to seal a four-inch (ten-centimeter) borehole in the Salado Formation near Carlsbad, NM. The dominantly halite salt strata contain a horizon rich in potassium-bearing minerals such as langbeinite, in the plug region. Other host rock minerals identified include illite, kainite, magnesite, syngenite and polyhalite. Identified in the plug were: the cement phase calcium silicate hydrate (C-S-H having an intermediate degree of crystallinity), Friedel's salt, halite, sylvite and portlan-

dite. The plug, though intact, unfractured on a macroscale, and forming an adequate physical bond with the salt formation, was weak and permeable relative to the surrounding bedded salt. Characterization of the plug and rock was carried out by a combination of measurements: compressive strength, permeability, density and porosity, thermal measurements (DTA, TGA), x-ray diffractometry, SEM and optical (including thin section) microscopy, and energy-dispersive x-ray analysis for chemical composition.

18094 **(ORNL/MIT—325) Use of extractive distillation to produce concentrated nitric acid.** Campbell, P.C.; Griffin, T.P.; Irwin, C.F. (Massachusetts Inst. of Tech., Oak Ridge, TN (USA). School of Chemical Engineering Practice; Oak Ridge National Lab., TN (USA)). Apr 1981. Contract W-7405-ENG-26. 56p. NTIS, PC A04/MF A01.

Concentrated nitric acid (> 95 wt %) is needed for the treatment of off-gases from a fuels-reprocessing plant. The production of concentrated nitric acid by means of extractive distillation in the two-pot apparatus was studied to determine the steady-state behavior of the system. Four parameters, EDP volume (V/sub EDP/) and temperature (T/sub EDP/), acid feed rate, and solvent recycle, were independently varied. The major response factors were percent recovery (CPRR) and product purity (CCP). Stage efficiencies also provided information about the system response. Correlations developed for the response parameters are: CPRR = 0.02(V/sub EDP/ - 800 cc) + 53.5; CCP = -0.87 (T/sub EDP/ - 140°C) + 81; eta/sub V,EDP/ = 9.1(F/sub feed/ - 11.5 cc/min) - 0.047(V/sub EDP/ - 800 cc) - 2.8(F/sub $Mg(NO_3)_2$/ - 50 cc/min) + 390; and eta/sub L,EDP/ = 1.9(T/sub EDP/ - 140°C) + 79. A computer simulation of the process capable of predicting steady-state conditions was developed, but it requires further work.

18095 **(ORNL/TM—7671) Disintegration and size reduction of slags and metals after melt refining of contaminated metallic wastes.** Heshmatpour, B.; Copeland, G.L.; Heestand, R.L. (Oak Ridge National Lab., TN (USA)). Apr 1981. Contract W-7405-ENG-26. 25p. NTIS, PC A02/MF A01.

Melting under an oxidizing slag is an attractive method of decontaminating and reducing the volume of radioactively contaminated metal scrap. The contaminants are concentrated in a relatively small volume of slag, which leaves the metal essentially clean. A potential method of permanently disposing of the resulting slags (and metals if necessary) is emplacing them into deep shale by grout hydrofracture. Suspension in grout mixtures requires that the slag and metal be granular. The feasibility of size-reducing slags and disintegrating metals and subsequently incorporating both into grout mixtures was demonstrated. Various types of slags were crushed with a small jaw crusher into particles smaller than 3 mm. Several metals were also melted and water-blasted into coarse metal powder or shot ranging in size from 0.05 to 3 mm. A simple low-pressure water atomizer having a multiple nozzle with a converging-line jet stream was developed and used for this purpose. No significant slag dust and steam were generated during slag crushing and liquid-metal water-blasting tests, indicating that contamination can be well contained within the system. The crushed slags and the coarse metal powders were suspendable in group fluids, which indicates probable disposability by shale hydrofracture. The granulation of slags and metals facilitates their containment, transport, and storage.

18096 **(PNL—3776) Characterization of transuranium: contaminated solid wastes residues.** Bryan, G.H. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Apr 1981. Contract AC06-76RL01830. 30p. NTIS, PC A03/MF A01.

The selection of technologies for the immobilization of transuranic wastes will depend in part upon the chemical and physical nature of the wastes. Characterization of some of the more important defense transuranic wastes is necessary to develop and evaluate alternative immobilization systems that might be applied to selected defense transuranic wastes. Process sludge and incinerator ash were selected for detailed study because of their importance in the transuranic waste inventory and because of proposed waste acceptance criteria that would exclude sludge and ash as-generated. By experimentally determining the variations in the chemical and physical properties of these wastes, it will be possible to develop and characterize immobilization products (and processes) and to examine their sensitivity to variations in the waste. Results indicate that there can be rather large differences in the composition of the two wastes. In the case of incinerator residues, large variations in the chemical composition may be expected if the feed is not homogenized to some extent. With sludge, analyses indicated variations in some metallic constituents at a given site and significant variations between sites.

18097 **(RHO-BWI-C—74) Program DAMSWEL: programming manual, code verification, program listing.** Boonlualohr, P.; Mustoe, G.; Williams, J.R. (Dames and Moore, Burlington, MA (USA)). 21 Jul 1980. Contract AC06-77RL01030. 208p. NTIS, PC A10/MF A01.

DAMSWEL is a finite element computer program for nonlinear, transient, thermal stress analysis of two-dimensional isotropic and anisotropic locking material bodies. The program was developed for the numerical predictive analysis of basalt response for Near-Surface Test Facility (NSTF) heater tests by Rockwell Hanford Operations, Richland, Washington. The main features of DAMSWEL consist of subprograms COLDD and MATLOC. The first feature, COLDD, is the heat conduction modules capable of analyzing material with temperature-dependent thermal properties, such as basalt. The second feature, MATLOC, is the nonlinear stress analysis module in which a bilinear locking stress-strain model is specifically incorporated to simulate the behavior of fractured basalt.

18098 **(RHO-BWI-LD—31) Drilling history of core holes DH-18 and DH-19.** Lillie, J.T.; Diediker, L.D.; Ledgerwood, R.K. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Dec 1980. Contract AC06-77RL01030. 58p. NTIS, PC A04/MF A01.

The successful on-schedule completion of Core Holes DH-19 and DH-19 demonstrated that unconsolidated sediments can be cored by experienced drilling personnel with relatively good recovery (greater than 75%).

18099 **(RHO-BWI-LD—34) Full-scale heater tests No. 1 and No. 2 at the Near-Surface Test Facility: preliminary results.** Case, J.B.; Krug, A.D.; Williams, J. (Rockwell International Corp., Richland, WA (USA). Energy Systems Group). 1980. Contract AC06-77RL01030. 31p. NTIS, PC A03/MF A01.

The Basalt Waste Isolation Project, as part of the National Waste Terminal Storage Program, initiated two full-scale electrical heater tests in basalt at the Near-Surface Test Facility, near Richland, Washington. The electric heaters simulate heat generation from radioactive waste canisters emplaced in the floor of a basalt rock mass. Preliminary analysis of the temperature data accumulated over 70 days since the July 1, 1980 startup suggest that the principal mode of heat transfer within the near field for the tested conditions is by heat conduction and that temperatures are largely unaffected by surface convection from the tunnel floor. Laboratory measurements of thermal properties used in conjunction with transient heat conduction analysis can be used to predict temperatures within a basalt rock mass reasonably well.

18100 **(RHO-BWI-LD—37) Drilling history of the extension by coring of Borehole DC-7.** Clawson, T.S.; Ledgerwood, R.K.; Diediker, L.D. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Jan 1981. Contract AC06-77RL01030. 33p. NTIS, PC A03/MF A01.

Relatively few permeable zones were encountered in the cored portion of DC-7; therefore, coring operations were completed in less than the amount of time projected. Limited hydrologic testing during drilling was done and no cementing or borehole repair was required. Few drilling problems beyond short runs, due to highly fractured rock, were encountered.

18101 **(RHO-LD—81-101-A) Long-term high-level defense waste technology. Progress report, October-December 1980.** (Rockwell International Corp., Richland, WA (USA). Energy Systems Group). 1980. Contract AC06-77RL01030. 42p. NTIS, PC A03/MF A01.

Results of progress completed during the quarter ending December, 1980 are reported. Several reports have been published. Accomplishments in the area of waste preparation include: (1) a strategy for developing methods for in situ disposal of Hanford in-tank radioactive waste; (2) a preliminary classification of in-tank radioactive waste; (3) work on evaluating waste forms for in situ disposal of in-tank waste (the plan is to identify a low-cost and low-temperature process for immobilizing the waste); and (4) layout design drawings of the waste retrieval articulated arm working model. In the area of waste fixation, eight new glass compositions were formulated with Purex sludge and tested for comparison with earlier compositions. Leachability of clay ceramic samples prepared by Ohio State University was measured. The strontium leach rates were below detection limits (2×10^{-8} g/cm^2-day). The cesium leach rates varied from 1.25×10^{-3} to 5.0×10^{-7} g/cm^2-day.

18102 **(STI/PUB—562) Management of Alpha-Contaminated Wastes.** (International Atomic Energy Agency, Vienna (Austria)). Jan 1981. 727p. (In English and French). (CONF-800611—). IAEA.

From International symposium on the management of alpha-contaminated wastes; Vienna, Austria (2 Jun 1980).

The symposium on Management of Alpha-Contaminated Wastes was held in Vienna on June 2 to 6, 1980. Forty-seven papers were presented which covered essentially the main aspects of managing alpha-contaminated wastes. The main topics of interest were the volume reduction techniques, the technology for incorporating the concentrates into solid forms and the choice of the matrix for safe interim storage and disposal. The multibarrier scheme and the options for disposal of waste into geological formation were also discussed. The symposium consisted of the following eight sessions: general policies and particular aspects; alpha-waste management practices; volume-reduction techniques; conditioning; alpha monitoring; actinides partitioning; disposal options.

18103 **(USGS-OFR—81-156) Geology of the Twinridge pluton area, Nevada Test Site, Nevada.** Maldonado, F. (Geological Survey, Denver, CO (USA)). 1981. Contract AI08-78ET44802. 33p. NTIS, PC A03/MF A01.

The Twinridge pluton is evaluated as a potential site for nuclear waste storage in crystalline rocks. The Twinridge pluton is quartz monzonite that crops out over an area of approximately 76 m^2 in the Halfpint Range, northeastern Nevada Test Site. It intrudes the Johnnie Formation and Stirling Quartzite of Precambrian age, and is overlain by Tertiary volcanic rocks. The area is structurally characterized by Basin and Range faults, folds, and thrust faults. The Twinridge pluton area should not be considered for further study as a potential nuclear waste repository for the following reasons: (1) it lies within one of the most highly faulted zones at the Nevada Test Site; (2) numerous Quaternary faults displace alluvium, a few of which can be traced into bedrock immediately northeast of the Twinridge pluton exposures; and (3) characterization of the Twinridge pluton would be difficult without extensive drilling and additional geophysical surveys.

18104 **(SAND—80-2577(Vol.2)(Pt.2)) Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 2 of 2.** Talbert, D.M. (ed.). (Sandia National Labs., Albuquerque, NM (USA)). Apr 1981. Contract AC04-76DP00789. 756p. NTIS, PC A99/MF A01.

Volume II of the sixth annual report describing the progress and evaluating the status of the Subseabed Disposal Program contains the appendices referred to in Volume II, Summary and Status. Because of the length of Volume II, it has been split into two parts for publication purposes. Part 1 contains Appendices A-O; Part 2 contains Appendices P-FF. Separate abstracts have been prepared for each appendix for inclusion in the Energy Data Base.

18105 (SAND—80-2577(Vol.2)(Pt.2), pp 599-612) **Appendix Y: penetrator emplacement of wastes in seabed sediments.** Brown, W.T. Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 2 of 2.

The goal of two-dimensional computer modeling of the dynamic emplacement process in seabed sediments is to determine if hole closure can be achieved during the emplacement. Currently, the sediments are being modeled as a linear, elastoplastic material and the constitutive description does not account for the presence of pore water. More realistic models are being developed, but calculations are in progress with existing models to assess the ability of computer codes to treat emplacement problems. Comparisons have been made between calculations and experiments of laboratory scale tank test simulations. Similar comparisons have been made for field tests conducted in lake bed sediments at Wendover, Utah. In each case, favorable agreement was obtained between calculations and experiments. Although favorable agreement is obtained, calculations still have not been done which will allow definitive statements to be made regarding hole closure in the actual in situ case.

18106 (SAND—80-2577(Vol.2)(Pt.2), pp 613-620) **Appendix Z: instrumented seabed penetrator project (ISPP).** James, L.T. Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 2 of 2.

The Instrumented Seabed Penetrator Project (ISPP) being conducted by 5627 relates directly to the Subseabed Disposal Program (SDP). The objective of the ISPP is to develop a penetrator system with the capability to: place instruments and/or suitably packaged wastes in seabed sediments at sediment depths to 50 m in water depths down to 6 km; and transmit information from the penetrator to a surface ship. As indicated by the objective statement, the ISPP can be subdivided into three major areas of concern: instrumentation, emplacement, and communication. The emphasis in CY 1979 has been on emplacement and communication as necessary first steps. The progress achieved in these two areas during CY 1979 is discussed. If a penetrator with reasonable mass is to achieve a sediment-penetration depth of 50 m in deep water, it must be propelled. Attention thus far has been focused on explosive propellants. Preliminary designs for a gun and penetrator have been completed. The gun design is based on a gun developed by the Navy Civil Engineering Laboratory to implant anchors. Orders have been placed for the major components of the gun. The penetrator design is based on previous experience involving penetration of saturated, under-consolidated clays at Wendover, Utah. In many applications it may be advisable to separate the communication link between a penetrator and a surface ship into 2 links (from penetrator to relay and from relay to ship). Methods of communication are under investigation.

18107 (SAND—80-2577(Vol.2)(Pt.2), pp 745-764) **Appendix FF: 1979 international seabed working group report to the NEA - participants and observers.** Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 2 of 2.

A summary report to the NEA Radioactive Waste Management Committee (RWMC) on the fourth international workshop on seabed disposal of high-level radioactive waste, held on March 5-7, 1979, in Albuquerque, New Mexico is presented. The RWMC members from Canada, France, Japan, the United Kingdom, and the United States were represented through the Seabed Working Group (SWG). Representatives from the Federal Republic of Germany and the Netherlands also participated as observers, with the concurrence of their RWMC members. Specific areas of cooperation were reported by the SWG Task Groups and coordination of joint projects was planned.

18108 **DOE radioactive waste incineration technology.** Borduin, L.C. (Los Alamos Scientific Lab., NM); Taboas, A.L. *Nuclear Safety ;* **22**: No. 1, 56-69(Jan 1981).

The current inventory of low-level radioactive waste (radwaste) from defense and commercial industries is approx. 2×10^6 m^3 and increases approx. 10^5 m^3/y due to current operations. Most of this waste can be classified as combustibles, liquids and sludges, or as noncombustible solids. The substantial combustible fraction, which has the greatest potential for effective waste treatment, constitutes an average of 40% of the newly generated waste. Proper incineration reduces waste mass and volume, results in a more homogeneous and chemically inert waste form, and also enhances the safety and certainty of waste handling, packaging, and storage and/

or disposal operations. This article presents an introduction to incineration concerns and an overview of the prominent radwaste incineration processes being developed within the Department of Energy. Brief process descriptions, the status and goals of individual incineration systems, and planned or potential applications are also included.

18109 Here's how US seeks waste sites. Newcomb, W.E. (Office of Nuclear Waste Isolation, Columbus, OH). *Geotimes ;* **25**: No. 12, 18-20(Dec 1980).

In order to more fully develop the concept of mined geological repositories for high-level radioactive wastes - the concept of initial emphasis of the National Waste Terminal Storage Program - geological exploration was undertaken in 6 states during 1980. In addition to the field exploration carried out on Federal reservations at the Nevada Test Site and Hanford, Washington, and in the states of Louisiana, Mississippi, Texas, and Utah, an extensive literature survey was undertaken during 1980. This study was designed to identify regions underlain by granitic and argillaceous rock formations that appear worthy of detailed geological evaluation. The 6 areas under field exploration are discussed in some detail. (BLM)

18110 Method of handling radioactive alkali metal waste. Mcpheeters, C.C.; Wolson, R.D. (to Department of Energy). US Patent 4,234,449. 18 Nov 1980. Filed date 30 May 1979. vp.

PAT-APPL-043855.

Radioactive alkali metal is mixed with particulate silica in a rotary drum reactor in which the alkali metal is converted to the monoxide during rotation of the reactor to produce particulate silica coated with the alkali metal monoxide suitable as a feed material to make a glass for storing radioactive material. Silica particles, the majority of which pass through a 95 mesh screen or preferably through a 200 mesh screen, are employed in this process, and the preferred weight ratio of silica to alkali metal is 7 to 1 in order to produce a feed material for the final glass product having a silica to alkali metal monoxide ratio of about 5 to 1.

18111 Removal of uranium from aqueous HF solutions. Pulley, H.; Seltzer, S.F. (to Department of Energy). US Patent 4,234,555. 18 Nov 1980. Filed date 29 Jun 1978. vp.

PAT-APPL-920525.

This invention is a simple and effective method for removing uranium from aqueous HF solutions containing trace quantities of the same. The method comprises contacting the solution with particulate calcium fluoride to form uranium-bearing particulates, permitting the particulates to settle, and separating the solution from the settled particulates. The CaF2 is selected to have a nitrogen surface area in a selected range and is employed in an amount providing a calcium fluoride/uranium weight ratio in a selected range. As applied to dilute HF solutions containing 120 ppm uranium, the method removes at least 92% of the uranium without introducing contaminants to the product solution.

18112 Process for decomposing nitrates in aqueous solution. Haas, P.A. (to Department of Energy). US Patent 4,225,455. 30 Sep 1980. Filed date 20 Jun 1979. vp.

PAT-APPL-50380.

This invention is a process for decomposing ammonium nitrate and/or selected metal nitrates in an aqueous solution at an elevated temperature and pressure. Where the compound to be decomposed is a metal nitrate (E.G., a nuclear-fuel metal nitrate), a hydroxylated organic reducing agent therefor is provided in the solution. In accordance with the invention, an effective proportion of both nitromethane and nitric acid is incorporated in the solution to accelerate decomposition of the ammonium nitrate and/or selected metal nitrate. As a result, decomposition can be effected at significantly lower temperatures and pressures, permitting the use of system components composed of off-the-shelf materials, such as stainless steel, rather than more costly materials of construction. Preferably, the process is conducted on a continuous basis. Fluid can be automatically vented from the reaction zone as required to maintain the operating temperature at a moderate value-e.g., at a value in the range of from about 130*-200* C.

0530 Environmental Aspects

REFER ALSO TO CITATION(S) 18117, 19207, 19229, 19386

18113 (LA—8487-MS) Nuclide-migration field experiments. Erdal, B.R.; Wolfsberg, K.; Johnstone, J.K.; Erickson, K.L.; Friedman, A.M.; Fried, S.; Hines, J.J. (Los Alamos Scientific Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 75p. NTIS, PC A04/MF A01.

When considering groundwater flow and radionuclide retention in the complex flow systems that can occur in geologic formations, one has a serious problem in determining if laboratory studies are being performed under conditions appropriate to natural systems. This document is the project plan for a program designed to begin to address these problems. The project is being carried out jointly by the Los Alamos National Laboratory, Sandia National Laboratories, and Argonne National Laboratory. The work has three principal objectives: (1) to develop the experimental, instrumental, and safety techniques necessary to conduct controlled, small-scale radionuclide migration field experiments, including those involving actinides; (2) to use these techniques to define radionuclide migration through rock by performing generic, at-depth experiments under closely monitored conditions; and (3) to determine whether available lithologic, geochemical, and hydrologic properties together with existing or developing transport models are sufficient and appropriate to describe real field conditions.

18114 (ONWI—13) Estimated environmental effects of deep drilling. McPherson, R.B.; Waite, D.A.; Shipler, D.B.; Glora, M.A. (Battelle Memorial Inst., Columbus, OH (USA). Office of Nuclear Waste Isolation). Dec 1980. Contract AC06-76RL01830. 61p. NTIS, PC A04/MF A01.

Deep drilling activities are performed to collect data on geologic formations considered by the National Waste Terminal Storage (NWTS) program as potentially suitable for nuclear waste repositories. Deep drilling is indispensable to a thorough understanding of these formations. There may be some understanding of these formations. There may be some unavoidable minor environmental impacts associated with the drilling process. These impacts vary in type, permanence, and intensity, depending on local conditions. Minor, long-lasting impacts typically result from modification of land surfaces for site preparation and access road construction. Temporary impacts for the duration of drilling include noise generated by drilling operations, changes in visual appearance at the site, modification of land use, disturbance of biota and changes in surface-water quality. Impacts are controlled or mitigated as necessary to prevent significant environmental degradation in the drilling areas. After completion of drilling and related activities sites are restored as required. In summary, typical drilling and related operations, when conducted according to the guidelines contained within this document, should not cause significant effects to the quality of the environment. No measurable effects on the environment results. The effects are temporary (on the order of several months).

18115 (ONWI—105) Estimated environmental effects of geologic and geophysical exploratory activities. McPherson, R.B.; Waite, D.A.; Shipler, D.B.; Glora, M.A. (Enviros-phere Co., Bellevue, WA (USA)). Dec 1980. Contract AC06-76RL01830. 60p. NTIS, PC A04/MF A01.

The office of Nuclear Waste Isolation (ONWI), Battelle Memorial Institute, is responsible for managing parts of the National Waste Terminal Storage (NWTS) Program administered by the US Department of Energy. Under this Program, ONWI is investigating sites potentially suitable for long-term disposal of nuclear wastes. The process to identify such sites is lengthy, requiring extensive geologic, engineering and environmental studies. The purpose of this report is twofold. First, it describes the wide range of geologic and geophysical studies that are or may be conducted as part of the NWTS Program. Second, it discusses potential environmental impacts associated with these studies. The environmental discussions focus on activities with the greatest potential impact and describe techniques to mitigate them. The geologic and geophysical studies described in this report do not specifically include those impacts associated with deep drilling activities. This report consists of two major sections. Section 2 describes the geologic and geophysical

activities which may take place at selected site locations. Section 3 focuses on the most potentially affected resources and describes the potential environmental impacts associated with activities identified in Section 2.

18116 **Draft environmental impact statement. Uranium milling.** Washington, DC; Nuclear Regulatory Commission (1979). vp. (NUREG—0511). Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC. (MF or HC) Order No. 79-0769.

This environmental impact statement on the US uranium-milling industry assesses the potential impacts of uranium-milling operations in a programmatic context. Major technical issues presented include disposal of mill tailings as a long-term waste management problem, including the long-term waste management problem, including the long-term isolation of tailings from populations; control of persistent airborne emissions, particularly radon-222; protection of groundwater quality; decommissioning of mill structures and sites; control of radioactive airborne emissions resulting from mill operatings; and nonradiological environmental impacts and resource uses. Major institutional questions addressed include the need for land-use controls and site monitoring at tailings disposal sites; methods of providing financial assurance that tailings disposal and site decommissioning are accomplished by mill operators; and methods of funding long-term surveillance of tailings disposal sites. The means of assessment involves evaluation of a base case featuring a low level of environmental control.

0540 Health And Safety

REFER ALSO TO CITATION(S) 19276, 19377

18117 **(PNL—2892) Assessment of effectiveness of geologic isolation systems. A conceptual simulation model for release scenario analysis of a hypothetical site in Columbia Plateau Basalts.** Stottlemyre, J.A.; Petrie, G.M.; Benson, G.L.; Zellmer, J.T. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Jan 1981. Contract AC06-76RL01830. 180p. NTIS, PC A09/MF A01.

This report is a status report for an evolving methodology for release scenario development for underground nuclear waste repositories. As such, it is intended for use as a reference point and a preliminary description of an evolving geoscience methodology. When completed this methodology will be used as a tool in developing disruptive release scenarios for analyzing the long-term safety of geological nuclear waste repositories. While a basalt environment is used as an example, this report is not intended to reflect an actual site safety assessment for a repository in a media. It is rather intended to present a methodology system framework and to provide discussions of the geological phenomena and parameters that must be addressed in order to develop a methodology for potential release scenarios. It is also important to note that the phenomena, their interrelationships, and their relative importance along with the overall current structure of the model will change as new geological information is gathered through additional peer review, geotechnical input, site specific field work, and related research efforts.

18118 **(SAND—80-2043C) Safety assessment of spent-fuel transportation in extreme environments.** Sandoval, R.P.; Weber, J.P.; Newton, G.J. (Sandia National Labs., Albuquerque, NM (USA); Inhalation Toxicology Research Inst., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 15p. (CONF-810217—13). NTIS, PC A02/MF A01.

From ANS waste management conference; Tucson, AZ, USA (23 Feb 1981).

Preliminary estimates of the health effects and/or consequences resulting from a malevolent attack on a spent fuel truck shipment in downtown New York City have been made. This estimate is based upon a measured quantity (0.78 +- 0.05 g) of respirable radioactive material released from a 1/4 scale event. A linear extrapolation from the 1/4 scale event to the generic full scale event has been made and an aerosolized release fraction (0.0023 percent) of the total heavy metal inventory of a three-PWR assembly truck cask has been calculated. Although scaling of the source term parameters is tentative at this point in the program, a full scale experiment is planned in 1981 to verify the scaling methodology used in these calculations. A preliminary correlation between spent fuel and surrogate fuel source terms has been shown to be feasible and that radionuclide size partitioning can be determined experimentally. Finally, it has been shown, based on our preliminary experimental source term data, that a maximum of 25 total latent cancer fatalities could occur, assuming a release in downtown New York City. This is 20 times smaller than the latent cancer fatalities predicted in the Urban Study.

18119 **Radiological impacts of uranium recovery in the phosphate industry.** Ryan, M.T. (Oak Ridge National Lab., TN). *Nuclear Safety ;* **22**: No. 1, 70-77(Jan 1981).

This article characterizes the occupational and public radiological health impacts associated with phosphate mining and milling. These impacts are related to the phosphate industry's uranium production potential and are compared with those associated with conventional uranium mining and milling. The radiological impacts resulting from occupational and nonoccupational exposures are assessed. Occupational exposures in phosphate facilities are compared to background exposures and radiological population dose assessments, which characterize important radionuclides and exposure pathways. The following conclusions were reached: (1) public consequences of phosphate mining will occur whether or not uranium is recovered as a by-product, (2) radiological consequences of phosphate mining may be comparable to those associated with uranium mining and milling per unit uranium production, (3) radiological impacts via surface waterways and crops fertilized with uranium-bearing phosphates are of minor consequence, and (4) major radiological public health problems associated with phosphate mining are related to radon and radon progeny exposures in structures built on reclaimed lands or with phosphate mining residues, although the magnitudes of these impacts are difficult to evaluate with current data.

0550 Regulations

REFER ALSO TO CITATION(S) 19015

18120 **(DOE/DP—0001-7) Semi-annual report on strategic special nuclear material inventory differences.** (Department of Energy, Washington, DC (USA). Office of Safeguards and Security). Jan 1981. 25p. NTIS, PC A02/MF A01.

This report provides and explains the differences between the amounts of nuclear materials charged to DOE facilities and the amounts that could be physically inventoried. This report covers data for the period from October 1, 1979, through March 31, 1980, and includes accounting corrections for data from earlier periods. It is the seventh such semiannual report. These data and explanations, together with the absences of physical indications of any theft attempt, support a finding that during this period no theft or diversion of strategic spcial nuclear material has occurred.

18121 **(LA—8590-PR) Nuclear Safeguards Research and Development. Program status report, July-September 1980.** Keepin, G.R. (ed.). (Los Alamos National Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 69p. NTIS, PC A04/MF A01.

This report presents the status of the Nuclear Safeguards Research and Development program pursued by the Los Alamos National Laboratory Safeguards Groups Q-1, Q-2, Q-3, Q-4, Q-5, and CMB-1. Topics covered include nondestructive assay technology development and applications, international safeguards, perimeter safeguards and surveillance, concepts and subsystems development, integrated safeguards systems, training courses, technology transfer, and analytical chemistry methods for fissionable materials safeguards.

18122 **(LA—8761-M) User's manual for a process model code.** Kern, E.A.; Martinez, D.P. (Los Alamos National Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 97p. NTIS, PC A05/MF A01.

The MODEL code has been developed for computer modeling of materials processing facilities associated with the nuclear fuel

cycle. However, it can also be used in other modeling applications. This report provides sufficient information for a potential user to apply the code to specific process modeling problems. Several examples that demonstrate most of the capabilities of the code are provided.

18123 **(LA—8764-MS) Spent-fuel composition: a comparison of predicted and measured data.** Thomas, C.C. Jr.; Cobb, D.D.; Ostenak, C.A. (Los Alamos National Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 27p. NTIS, PC A03/MF A01.

The uncertainty in predictions of the nuclear materials content of spent light-water reactor fuel was investigated to obtain guidelines for nondestructive spent-fuel verification and assay. Values predicted by the reactor operator were compared with measured values from fuel reprocessors for six reactors (three PWR and three BWR). The study indicates that total uranium, total plutonium, fissile uranium, fissile plutonium, and total fissile content can be predicted with biases ranging from 1 to 6% and variabilities (1-σ) ranging from 2 to 7%. The higher values generally are associated with BWRs. Based on the results of this study, nondestructive assay measurements that are accurate and precise to 5 to 10% (1σ) or better should be useful for quantitative analyses of typical spent fuel.

18124 **(LA—8767-MS) Irradiated fuel examination using the Cerenkov technique.** Nicholson, N.; Dowdy, E.J. (Los Alamos Scientific Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 16p. NTIS, PC A02/MF A01.

A technique for monitoring irradiated nuclear fuel inventories located in water filled storage ponds has been developed and demonstrated. This technique provides sufficient qualitative information to be useful as a confirmatory technique to International Atomic Energy Agency inspectors. Measurements have been made on the Cerenkov glow light intensity from irradiated fuel that show the intensity of this light to be proportional to the cooling time. Fieldable instruments used in several tests confirm that such measurements can be made easily and rapidly, without fuel assembly movement or the introduction of apparatus into the storage ponds. The Cerenkov technique and instrumentation have been shown to be of potential use to operators of reactor spent fuel facilities and away from reactor storage facilities, and to the International Atomic Energy Agency inspectors who provide surveillance of the irradiated fuel stored in these facilities.

18125 **(LA—8793-MS) Evaluation of Savannah River Plant shuffler calibration standards.** Meier, M.M.; Crane, T.W.; Nachtsheim, C.J. (Los Alamos National Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 28p. NTIS, PC A03/MF A01.

Six chemistry and three nondestructive assay (NDA) measurements have been made to provide information on the ^{235}U content of twelve standards cut from a cylinder of uranium-aluminum alloy to be used in calibrating the ^{252}Cf shuffler. These data have been evaluated to produce a set of uranium mass estimates and associated uncertainties for the standards by means of least squares techniques. Longitudinal fluctuation in uranium density is modeled, both by linear splines and by polynomials, and the two methods are compared. Also, a method is given for assessing the accuracy of the measurement uncertainties initially provided.

18126 **(SAND—80-2592C) Improving the performance of personnel portals for safeguards.** (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 6p. (CONF-810606—3). NTIS, PC A02/MF A01.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

The conclusions of this study indicate that considerable improvement can be made to commercially available portal technology and that increases in sensitivity up to a factor of 50 are not uncommon for portal configurations being evaluated. Therefore, monitors that incorporate the recommended modifications can significantly improve the effectiveness of safeguards personnel portals.

18127 **(SAND—80-8057) Tritium control and accountability instructions.** Wall, W.R. (Sandia National Labs., Albuquerque, NM (USA)). Mar 1981. Contract AC04-76DP00789. 21p. NTIS, PC A02/MF A01.

This instruction describes the tritium accountability procedures practiced by the Tritium Research Laboratory, Building 968 at Sandia National Laboratories, Livermore. The accountability procedures are based upon the Sandia National Laboratories, Livermore, Nuclear Materials Operations Manual, SAND78-8018. The Nuclear Materials Operations Manual describes accountability techniques which are in compliance with the Department of Energy Manual, Code of Federal Regulations, and Sandia National Laboratories Instructions.

18128 **(SAND—81-1027C) Development of seals for safeguards.** Harvey, G.L.; Waddoups, I.G. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 6p. (CONF-810502—2). NTIS, PC A02/MF A01.

From 3. symposium on safeguards and nuclear material management; Karlsruhe, F.R. Germany (6 May 1981).

During the last several years there has been a significant increase in efforts to improve existing seals and to develop new seals for application in international safeguards. Sandia National Laboratories in the United States has been participating in these efforts. This paper reports on the status of the Sandia Programs.

18129 **Motivations and possible actions of potential criminal adversaries of US nuclear programs.** Bass, G.; Jenkins, B.; Kellen, K.; Krofcheek, J.; Petty, G.; Reinstedt, R.; Ronfeldt, D. (Radian Corp., Santa Monica, CA). *Nuclear Safety* ; **22**: No. 1, 21-25(Jan 1981).

The motivations that might impel individuals or groups to undertake criminal actions against US nuclear facilities or programs are explored in the report (R and R-2554-SL) from which this note is taken. The analysis involves examination of the motivations behind nuclear-related crimes that have already occurred and of those behind analogous nonnuclear crimes.

18130 **State Planning Council on Radioactive Waste Management. Interim report.** Washington, DC; State Planning Council on Radioactive Waste Management (1981). 108p. (NP—25311).

The State Planning Council on Radioactive Waste Management was established under Executive Order No. 12192 (February 12, 1980) for the purpose of providing advice and recommendations to the President and the Secretary of Energy on ways to strengthen the working relationship between the Federal government and state, local, and tribal governments in radioactive waste management. This Interim Report contains Council recommendations on consultation and concurrence for permanent repositories, low-level waste management, the National Plan for Radioactive Waste Management, transportation of radioactive waste, and a summary of the Council's deliberations on the interim storage of spent nuclear fuel.

06 FUSION FUELS

0602 Processing

18131 (DOE/DP/40030—2, pp 1.1-1.51) **Inertial fusion target technology.** 1979. NTIS, PC A09/MF A01.

In Inertial fusion research. Annual technical report, 1979.

Along with the activities in glass shell technology, capability to produce polymeric microshell targets and coatings was expanded. Previous disadvantages in using polymeric shells, such as low tensile strength, inadequate quality, and unacceptably high permeability were overcome by the development of new polymer systems and cryogenic processing technology. The approach in the area of IF reactor target technology consisted of determining technologies potentially capable of meeting its high volume production requirements. The major thrust of this effort was to demonstrate the capabilities of semiconductor processing technologies to produce multishell configurations. Cryogenic technology was also committed primarily to solution of multishell problems, e.g., the production of cryogenic fuel layers within double shell targets. Remaining efforts

in the area of reactor target technology were to extend our glass shell fabrication to produce shells approaching the dimensions required by reactor targets.

18132 **Hollow microspheres of silica glass and method of manufacture.** Downs, R.L.; Miller, W.J. (to Dept. of Energy). US Patent Application 178,266. 15 Aug 1980. 14p.

A method of manufacturing glass frit suitable for use as a starting material in the manufacture of hollow glass microspheres having a high concentration of silica. The frit is manufactured from a gel containing boron in the amount of about 1% to 20% (oxide equivalent mole percent), alkali metals, specifically potassium and sodium, in an amount exceeding 8% total, and the remainder silicon. Preferably, the ratio of potassium to sodium is greater than 1.5.

0603 By-products

18133 **(BNL—29049) Review of fusion/high-temperature electrolysis process.** Fillo, J.A.; Powell, J.R. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 4p. (CONF-810606—27). NTIS, PC A02/MF A01.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

The electrochemical decomposition of water into hydrogen and oxygen is reviewed. A fusion blanket design for supplying the process heat required is considered. (MOW)

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY

0701 Physical Isotope Separation

REFER ALSO TO CITATION(S) 19437

18134 **(DOE/NDC—13(Rev.)) Stable isotope research pool inventory.** (Department of Energy, Washington, DC (USA). Div. of Chemical Sciences). Jan 1981. 58p. (INDC(USA)—80/G(Rev.); NEANDC(US)—204/A(Rev.)). NTIS, PC A04/MF A01.

This report contains a listing of electromagnetically separated stable isotopes which are available for distribution within the United States for non-destructive research use from the Oak Ridge National Laboratory on a loan basis. This inventory includes all samples of stable isotopes in the Materials Research Collection and does not designate whether a sample is out on loan or in reprocessing. For some of the high abundance naturally occurring isotopes, larger amounts can be made available; for example, Ca-40 and Fe-56.

0702 Radiation Sources

REFER ALSO TO CITATION(S) 18926

18135 **Measurements of neutron spectra and fluxes at spallation-neutron sources and their application to radiation effects research.** Kirk, M.A.; Birtcher, R.C.; Blewitt, T.H. (Argonne National Lab., IL (USA). Materials Science Div.); Greenwood, L.R.; Popek, R.J.; Heinrich, R.R. (Argonne National Lab., IL (USA). Chemical Engineering Div.). *Journal of Nuclear Materials ;* **96**: No. 1/2, 37-50(Jan 1981).

We have measured the neutron spectra, fluxes, and flux distributions produced by nuclear spallation resulting from 478 MeV proton bombardment of tantalum and depleted uranium targets surrounded by a thick lead neutron reflector. The configuration was chosen to simulate a radiation effects facility at a spallation-neutron source. The method of multiple foil activation with spectrum unfolding by the STAYSL computer code was used to measure the neutron spectra. The experimental results are compared in detail with the results of computer calculations on the same configuration of targets and reflector. The neutron production and transport codes HETC and VIM were employed in these calculations. The neutron spectra, and characteristic parameters for studies of radiation effects, are compared with those of fission-neutron sources. Based on the above measurements, the predicted performance and capabilities of the Radiation Effects Facility at the Intense Pulses Neutron Source at Argonne National Laboratory are discussed.

0703 Isotopic Power Supplies

18136 **(DPST—80-128-1) ^{238}Pu fuel form processes. Quarterly report, January-March 1980.** (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Mar 1981. Contract AC09-76SR00001. 31p. NTIS, PC A03/MF A01.

Progress in the general purpose heat source GPHS process demonstration program is reported. Fuel-Scale fabrication tests continued in the Plutonium Experimental Facility (PEF) with the successful fabrication of five additional GPHS pellets (GPHS Pellets 19 to 23). Characterization of GPHS Pellets 17 and 19 to 23 has been completed. Integral pellets of generally good quality continued to be produced in recent fabrication tests at SRL; however, pellets showed more cracks than did centerline pellets. GPHS Pellets 18, 20, and 22, which were fabricated under SRL centerline conditions, were packaged and shipped to LANSL for impact testing. Pre-test inspection at LANSL revealed that all pellets retained the integrity and dimensional stability observed at Savannah River. Direct-strike precipitation of Pu(III) oxalate would eliminate a number of powder-conditioning steps and, therefore, appears to be a safer and simpler method of producing feed for direct fabrication of $^{238}PuO_2$ fuel forms, according to recent SRL experiments. Powder characterization studies suggested that a mixture of sintered and unsintered rosettes made by direct-strike Pu(III) oxalate precipitation might be successfully substituted for the shards currently being used for fabrication of GPHS fuel forms.

18137 **(DPST—80-128-2) ^{238}Pu fuel form processes quarterly report, April-June 1980.** (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Apr 1981. Contract AC09-76SR00001. 45p. NTIS, PC A03/MF A01.

Savannah River Laboratory (SRL) completed the development of a production process to fabricate $^{238}PuO_2$ fuel forms for the GPHS. The fabrication flowsheet was based on a flowsheet originally developed at Los Alamos National Scientific Laboratory (LANSL). A summary report of the SRL process development effort is presented.

18138 **(LA—8824-PR) Space nuclear safety and fuels program. Progress report, January 1981.** Bronisz, S.E. (comp.). (Los Alamos Scientific Lab., NM (USA)). Apr 1981. Contract W-7405-ENG-36. 19p. NTIS, PC A02/MF A01.

This formal monthly report covers the studies related to the use of $^{238}PuO_2$ in radioisotopic power systems carried out for the Space and Terrestrial Systems Division of the US Department of Energy by Los Alamos National Laboratory. Most of the studies discussed here are of a continuing nature. Results and conclusions described may change as the work continues. Published reference to the results cited in this report should not be made without the explicit permission of the person in charge of the work.

08 HYDROGEN

0801 Production

REFER ALSO TO CITATION(S) 17930, 18133, 18144, 18277, 18297, 18391

18139 **Catalysis research in thermochemical water-splitting processes.** O'Keefe, D.R. (General Atomic Co., San Diego, CA); Norman, J.H.; Williamson, D.G. *Catalysis Reviews - Science and Engineering ;* **22**: No. 3, 325-369(1980).

Two approaches to the direct production of hydrogen as an energy source are direct electrolysis of water and thermochemical watersplitting. The state-of-the-art of catalysis research as applied

to the thermodynamic splitting of water is reviewed here. Rather detailed discussions of the catalytic processes most studied to date in the field, the decomposition of sulfuric acid and hydrogen iodide, are presented. Fifty-three references are cited. Many slow reactions are the bottlenecks in obtaining thermodynamically favorable watersplitting cycles, e.g., the decomposition of metastable HI liquid. In other water-splitting reactions there is no product separation in a high-temperature step, e.g., decomposition of SO_3. Catalysis supplies the solution to both of these problems in water-splitting processes. Some of the less studied catalytic systems also discussed are: the low-temperature reaction of phosphoric acid and water using Pd, Pt, and Ru, as well as wood charcoal, as catalysts; reactions of complexes of pyridine and dipyridyl with hydrogen bromide using a Pd catalyst; and the reaction of SO_2 steam to produce H_2SO_4 and S using heterogeneous catalysis. (BLM)

18140 **(DOE/ER/02747—T1) Thermochemical processes for hydrogen production by water decomposition. Final report.** Perlmutter, D.D. (Pennsylvania Univ., Philadelphia (USA)). Aug 1980. Contract AS02-76ER02747. 10p. NTIS, PC A02/MF A01.

The principal contributions of the research are in the area of gas-solid reactions, ranging from models and data interpretation for fundamental kinetics and mixing of solids to simulations of engineering scale reactors. Models were derived for simulating the heat and mass transfer processes inside the reactor and tested by experiments. The effects of surface renewal of solids on the mass transfer phenomena were studied and related to the solid mixing. Catalysis by selected additives were studied experimentally. The separate results were combined in a simulation study of industrial-scale rotary reactor performance. A study was made of the controlled decompositions of a series of inorganic sulfates and their common hydrates, carried out in a Thermogravimetric Analyzer (TGA), a Differential Scanning Calorimeter (DSC), and a Differential Thermal Analyzer (DTA). Various sample sizes, heating rates, and ambient atmospheres were used to demonstrate their influence on the results. The purposes of this study were to: (i) reveal intermediate compounds, (ii) determine the stable temperature range of each compound, and (iii) measure reaction kinetics. In addition, several solid additives: carbon, metal oxides, and sodium chloride, were demonstrated to have catalytic effects to varying degrees for the different salts.

18141 **(EUR—6987-FR) Electrolytic production of hydrogen by electrochemical reduction of water at 850°C. Construction and determination of the characteristics of an electrolysis cell surface of 50 cm^2. Final report.** Viguie, J.C. (CEA Centre d'Etudes Nucleaires de Grenoble, 38 (France)). 1980. 37p. (In French). NTIS (US Sales Only), PC A03/MF A01.

The electrochemical chain is H_2, H_2O/Ni/0.91 ZrO_2;0.09 Y_2O_3/oxide/O_2. The influence of preparation on the resistivity of the solid electrolyte has been studied. A typical figure is 18 Ω cm at 850°C. The cathode reactivity is dependent on the superficial concentration of the nickel grains on the interface. Studies of the current-overvoltage relations indicate that the maximum reactivity is achieved with a superficial resistance ranging between 50 and 150 mΩ. The disc support is an honeycomb shaped ceramic whose composition was adjusted to meet the expansion coefficient of zirconia 9.10^{-6} $°C^{-1}$. The support is chemically covered with a 15 microns nickel layer. Trial runs were made to insure that anodic and cathodic compartments were isolated and to determine the proper gas flow conditions.

18142 **(LA—8675-PR) Thermochemical processes for hydrogen production. Progress report, October 1, 1979-September 30, 1980.** Hollabaugh, C.M. (comp.). (Los Alamos National Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 20p. NTIS, PC A02/MF A01.

Thermochemical cycles for hydrogen production have been investigated at the Los Alamos National Laboratory since the early 1970s. The work consists of experimental and engineering research to define cycles that can be coupled feasibly to high-temperature heat sources for water-splitting to produce hydrogen and oxygen. Process development is sponsored by the Department of Energy, Division of Energy Storage System (STOR). In recent months, our efforts were directed toward improving the design and operation of our 1-in-diam laboratory-scale quartz rotary kiln. Our results from the decomposition of bismuth oxysulfate in the kiln have been shown the technical feasibility of solid sulfate decomposition in a flow mode with recycled feed in residence times less than 2 min. Other work included (1) engineering studies that compared the published estimates of capital costs and process efficiencies for hydrogen production by thermochemical means and by electrolysis, (2) review of two thermochemical cycles for hydrogen production, and (3) coordination of US contributions to the annual International Energy Agency Technical Workshop on Thermochemical Processes.

09 OTHER SYNTHETIC AND NATURAL FUELS

0901 Hydrocarbon Fuels

REFER ALSO TO CITATION(S) 18153, 18255, 18265, 18266, 18280, 18282, 18287, 18300, 18302, 19030, 19052

18143 **Infrared study of alumina- and silica-supported ruthenium cluster carbonyls.** Kuznetsov, V.L. (Lawrence Berkeley Lab., CA); Bell, A.T.; Yermakov, Y.I. Contract W-7405-ENG-48. *Journal of Catalysis ;* **65**: No. 2, 374-389(Oct 1980).

An investigation has been performed of the adsorption of $Ru_3(CO)_{12}$, α-$H_4Ru_4(CO)_{12}$, and $Ru_6C(C0)_{17}$ on γ-Al_2O_3 and SiO_2, and of the structures formed upon decomposition of the initially supported clusters. The extent of $Ru_3(CO)_{12}$ adsorption on γ-Al_2O_3 strongly depends on the temperature at which the support had been dehydroxylated. Infrared spectra of alumina-supported $Ru_3(CO)_{12}$ suggest that the cluster is adsorbed as a result of interactions between the carbonyl ligands and hydroxyl groups and Lewis acid sites present on the support surface. Similar interactions are proposed for alumina-supported α-$H_4Ru_4(CO)_{12}$ and $Ru_6C(CO)_{12}$. Decomposition of the supported clusters produces three surface structures, independent of the original cluster composition. The first structure is characterized by bands at 2045 to 2050 and 1965 to 1970 cm^{-1} and is represented by $[Ru(CO)_2X_2]$/sub n/. The second and third structures are characterized by bands at 2130 to 2140, 2060 to 2070, and 1990 to 2000 cm^{-1} and are represented by $[Ru(CO_3X_2]$/sub n/ and $[Ru(CO)_4X_2]$/sub n/, respectively. In each of the structures X represents an oxygen atom of the alumina lattice. The nuclearity of the surface structures, n, cannot be defined from the present studies. Complete decarbonylation of the Ru surface structures induces a stronger Ru-support interaction, which may lead to the entry of Ru ions into the support lattice and the formation of surface aluminates.

18144 **Synthesis, molecular dynamics, and reactivity of mixed-metal clusters.** Geoffroy, G.L. (Pennsylvania State Univ., University Park). *Accounts of Chemical Research ;* **13**: No. 12, 469-476(Dec 1980).

Various mixed-metal tetranuclear clusters have been prepared by the combination of a carbonylmetalate with a closed metal carbonyl trimer. The cluster included Fe, Ru, Os, and Co in various combinations. Since transition-metal cluster compounds are currently being examined as catalysts for a variety of reactions involving CO, the reactions of mixed-metal clusters with CO were examined. It was found that most of the clusters studied fragmented in the presence of CO under mild conditions. Results of kinetic studies of the reactions are presented. The cluster compounds were found to react with tertiary phosphines and phosphites to yield mono- and di-substituted clusters. Isomeric products were also found to result from the reaction of the cluster compounds with internal alkynes with hydrogen evolved during the reaction. Results of studies of the molecular dynamics of the series of clusters $H_2FeRu_3(CO)_{13}$, $H_2FeRu_2Os(CO)_{13}$ and $H_2FeRuOs_2(CO)_{13}$ in which Ru is progressively replaced by Os are reported, and several different fluxional processes were observed. The ^{13}C NMR spectra of these carbonyls are reported. (BLM)

18145 **Kinetic analysis of complex reaction systems--methanol conversion to low molecular weight olefins.** Anthony, R.G.; Singh, B.B. (Tex AandM Univ, College Station). *Chemical Engineering Communications ;* 6: No. 4-5, 215-224(1980).

An analysis of the selectivity data when converting methanol to low molecular weight hydrocarbons suggests that methane, propylene and propane are formed by the primary reaction of methanol decomposition. Ethane, carbon monoxide and dimethyl ether are formed by primary reactions and participate in secondary reactions. Carbon dioxide and ethylene are produced by secondary reactions. 26 refs.

0902 Alcohol Fuels

REFER ALSO TO CITATION(S) 18255, 18262, 18264, 18270, 18287, 18298, 18299

18146 **(DOE/AF/92011—1) Power Alcohol Plant, Pfister Bros. Farms. Technical progress report.** (Pfister Bros. Farms, Grabill, IN (USA)). 1981. Contract FG02-81AF92011. 9p. NTIS, PC A02/MF A01.

Progress is reported in the process engineering and construction of an alcohol plant. Substrate supply, waste carbohydrate material, has been reduced by 20%. Process heat will be supplied by a stoker boiler fired by natural gas in the initial stages, later by a mixture of corn cobs and coal. The design of the cooker is included. The selection of fermentation tanks has not been made. Studies in the selection of yeast for the project are underway. Distillation equipment is described. An appropriate technology for water removal has not been determined. Tests to determine the thermal efficiency of CaO as a water entraining agent are being conducted. The plant layout and construction schedule diagrams are included. (DMC)

0904 Solid Waste And Wood Fuels

REFER ALSO TO CITATION(S) 18850, 19097

13 HYDRO ENERGY

REFER ALSO TO CITATION(S) 18339, 18761, 18762

18147 **(CONF-791056—) Waterpower '79: the first international conference on small-scale hydropower.** (Corps of Engineers, Washington, DC (USA); Department of Energy, Washington, DC (USA)). 1979. 884p. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

Ninety-seven papers were presented at the meeting. A separate abstract was prepared for each of 94 papers. Three papers appeared previously in Energy Research Abstracts. Fifty-five of the papers will appear in Energy Abstracts for Policy Analysis (EAPA). (LCL)

18148 (CONF-791056—, pp 378-381) **Identification of hydroelectric research in support of small-scale and large-scale developments.** Ferreira, A. (Energy Storage and Hydraulic Engineering Electric Power Research Inst., West Springfield, MA). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The renewed utility interest in the hydroelectric technology, created partially by the rapid escalation of alternative energy costs and the cognizance of the necessity to reduce capital costs and production costs, is surfacing many design, engineering, construction, operation and maintenance problems. The EPRI staff has initiated a program of identifying those areas by the hydroelectric technology that can best reap the advantages and benefits of a coordinated effort of generic research, development, and demonstration. The engineering issues to be addressed will encompass the entire field from the small to the large conventional hydro and the pumped storage hydro. Those utilities which have substantial hydroelectric facilities or have indicated the planning initiatives towards hydro facilities are cooperating in this program of prioritizing, as well as identifying the supporting research needs that will provide long-term, as well as, near-term dividends. The generic research work is contemplated at this early stage of program identification towards satisfying certain basic objectives. Posted under each of the broad objectives are some design and study projects that have been identified to date by the EPRI staff and by a number of utilities; the list is not intended to be all-inclusive nor by any means restrictive.These objectives include: advancing the state-of-the-art of hydroelectric technology; improving the performance, reliability, and availability of existing and new generating units; improving the safety and reliability of existing and new dams and other water impounding and transfer structures; reducing the capital, operating and maintenance costs of hydroelectric facilities; and assessing, evaluating, and improving the utilization of hydroelectric resources and increasing public and environmental acceptance of hydroelectric facilities.

18149 (CONF-791056—, pp 418-421) **Small-scale hydro: an opportunity for historic preservation.** Novak, W.J. (Tippetts, Abbett, McCarthy, Stratton, Washington, DC); Heiderstadt, R.T. 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The historic significance of hydropower dams built in the US before 1920 and ways in which communities interested in the preservation of these historical sites and utility companies interested in power generation by site renovation can cooperate to achieve the goals are discussed. (LCL)

18150 (CONF-791056—, pp 720-726) **Small-scale hydropower development in the west.** Ingersoll, A.C. (Univ. of California, Los Angeles); Manasse, F.K.; English, J.M.; Master, D. 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

Activities of a July 30-August 1, 1979 workshop on small scale hydropower development in the Western US are summarized. Items considered included the power potential, marketing, utility interfacing, and economic issues. It was concluded from this meeting that perhaps 5400 MW of hydropower could be developed at existing dams, from units of less than 15 MW capacity. In California alone this figure would be on the order of 450 MW. (LCL)

18151 (CONF-791056—, pp 727-733) **Problems in evaluation of Federal small-hydro projects.** Mittlestadt, R.L. (Corps of Engineers, Portland, Oregon). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference. small scale hydropower; Washington, DC, USA (1 Oct 1979).

With the resurgence of interest in adding powerplants at existing Federal hydro projects has come a renewed interest in estimating the value of hydropower. Federal procedures are in a state of flux. The Water Resources Council's proposed Principles and Standards (P and S) evaluation manual is intended to lead us out of the woods, and the short-cut procedure for small hydro projects is definitely a step in the right direction. However, there are still a number of key factors in the hydropower chapter for which no specific guidance has been provided. Some of these factors are discussed, specifically, system energy costs, fuel cost escalation, inflation, dependable capacity, intermittent capacity, and the alternative means of evaluating small projects with little of no dependable capacity.

18152 (CONF-791056—, pp 776-781) **Small-scale hydropower: an appropriate technology for less-developed countries.** Kersten, R.D. (Univ. of Central Florida, Orlando). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The developing countries which contain approximately 70% of the world's population need to use renewable energy resources to satisfy basic needs of food and shelter and to improve their quality of life. Several technologies for power generation are compared on the basis of cost, availability and socio-economic factors. It is concluded that small-scale decentralized hydropower generation is

the appropriate technology for rural areas in developing countries. (LCL)

18153 (JPRS—77615) **China Report: economic affairs, No. 121. Energy: conservation efforts taking hold, new avenues explored.** (Joint Publications Research Service, Washington, DC (USA)). 18 Mar 1981. Translation of various articles. 119p. NTIS.

Information gathered primarily from foreign newspapers, periodicals and books on energy conservation efforts in China is assembled. Published articles on hydropower development, fuel conservation, methane production, and solar energy research are included. (LCL)

1301 Resources And Availability

REFER ALSO TO CITATION(S) 18213, 18215, 18220, 18226, 18231, 18234, 18758, 18759

18154 (CONF-791056—, pp 1-7) **Role of small-scale hydropower in emerging energy policy.** Watson, J.H. Jr. (Chief of Staff, The White House, Washington, DC). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The effect of oil imports for power production in the US on the national trade balance and economy, and the importance of developing hydroelectric power resources to relieve this strain are reviewed. (LCL)

18155 (CONF-791056—, pp 11-15) **National energy perspective.** Morris, J.W. (Army Corps of Engineers, Washington, DC). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The need for both large- and small-scale hydropower plants in the US is stressed, and projects within the US Army Corps of Engineers to develop potential hydro sites are discussed. (LCL)

18156 (CONF-791056—, pp 17-21) **Department of Energy's hydro program.** McIsaac, G.S. (Dept. of Energy, Washington, DC). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The four impediments to the widespread use of small-scale hydropower are identified as: lack of knowledge of the resource base; uncertainty about small-scale hydropower economics; lack of proof that the technology works; and the difficulty of transferring information to potential decision makers. US DOE programs, often operating in conjunction with other agencies, such as the Corps of Engineers, state planning groups, and the Water and Power Resources Services, which are aimed at removing these impediments are disucssed. (LCL)

18157 (CONF-791056—, pp 27-30) **Keynote is progress.** Clapp, N.M. (Dept. of Agriculture, Washington, DC). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The availability in the USA of water resources usable for low-head hydropower development, the economic feasibility of building or renovating low-head power plants, US DOE demonstration programs for stimulating interest in such developments, and legislative proposals to provide investment tax incentives for small hydro facilities are discussed. (LCL)

18158 (CONF-791056—, pp 33-35) **Revised regulations for licensing reform.** Sheldon, G. (Dept. of Energy, Washington, DC). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The need for developing national hydropower potential, the estimated capability of doubling or tripling current hydropower capacity by installing hydro power conversion equipment at existing dams, and the need for reform in licensing regulations and procedures in order to expedite hydro power development are discussed. (LCL)

18159 (CONF-791056—, pp 39-41) **Rural power needs.** Mercure, A. (Dept. of Agriculture, Washington, DC). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The growth of electric power demand in rural areas, and activities of the Rural Electrification Administration (REA) in promoting and financing low-head hydropower plants for membership-owned electric co-op systems are discussed. (LCL)

18160 (CONF-791056—, pp 45-51) **Recent trends in waterpower development and pumped storage.** Mosonyi, E.F. (Univ. of Karlsruhe, Germany). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

Starting with the fact that from the economically feasible hydropower potential of the globe, i.e., 4 million MW, not more than 10% is being utilized at present. Worldwide development of conventional, small-scale, and low-head hydroelectric power plants is briefly discussed with references to the use of water resources of the Rhine and Rhone Rivers, TVA, St. Lawrence, Danube, etc. The technical improvements in turbomachinery, the potential for pumped storage plants, and hydro power economics are mentioned. (LCL)

18161 (CONF-791056—, pp 55-58) **Hydroelectric power and energy-efficient responsibilities.** Durkin, J.A. (Senate, Washington, DC). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The economic and environmental advantages of hydropower, the potential for obtaining power by retrofitting existing dams, and actions that the Federal government can take to promote hydropower development are discussed. (LCL)

18162 (CONF-791056—, pp 63-65) **United Nations interest in water.** Bourne, P. (United Nations, New York, NY). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

United Nations activities in promoting the Water Decade during which member states will develop long-range plans as to how global water resources should be used are briefly described. (LCL)

18163 (CONF-791056—, pp 163-168) **Policy for applying small hydro to a utility system.** Allen, A.E. (Harza Engineering Co., Chicago, IL). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

Hydroelectric plants that will be built under the current impetus for such plants may in some instances be built for individual loads, but usually they will either be part of the electric utility system of their area, or their energy production will affect demand on the electric utility system. For the national economic welfare, it is essential that the utmost benefit be obtained from all energy that is produced. Therefore, hydroplants, large or small, should be analyzed relative to the electric utility system in their area. The general principles and an example are briefly discussed.

18164 (CONF-791056—, pp 169-174) **Hydropower development at water supply dams.** Linzell, L.E. (Burgess and Niple, Ltd., Columbus, OH). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The energy potential of water at municipal water supply dams is evaluated using conditions in Ohio as an example. The feasibility of using these dams for low-head hydropower development is examined, and technical aspects of such retrofitting are discussed. It is concluded that hydropower development at city-owned water supply dams is both technically and economically feasible and that the economic feasibility is enhanced by the low interest rates that cities enjoy due to their tax-free bonds. (LCL)

18165 (CONF-791056—, pp 210-217) **Practical hydrology for hydroplant planning and design.** Dixon, J.H. (Tippetts-Abbett-McCarthy-Stratton, New York, NY). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

Development, understanding and application of hydrologic data are essential elements in the planning and design of hydroelectric plants. Hydrology provides a basis for estimating the generating capacity a stream can economically support, the available energy and the requirements for flood protection of the powerhouse and other facilities. It is estimated that the cost of engineering for a feasibility study for a typical small plant is about $20 per kilowatt. A large percent of this cost is spent on the hydrologic aspects of projects. It follows then, that one way to cut down on the cost of engineering is to reduce the effort devoted to hydrology. This paper relates some recent experience in the planning and design for small-hydroelectric plants and emphasizes areas where costs have been reduced without affecting the quality of engineering. This experience is based on the preparation of six feasibility reports in the Northeast, and performing screening studies for potential sites in the New England area. Economy of time and money is accomplished by using computerized stream flow records available from the US Geological Survey and performing the data analysis required for a specific site. (LCL)

18166 (CONF-791056—, pp 218-225) **Determination of flow-duration curves at ungaged points in regulated streams.** Emmert, R.; Heitz, L. (Army Corps of Engineers, Walla Walla, WA). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

In making feasibility analyses of hydroelectric power sites, it is essential to be able to define the time variability of flows at the sites. In many feasibility studies a flow-duration curve is used to define this variability of flow. The flow-duration curve is a plot of discharge versus the percent of time that the discharge can be expected to be equaled or exceeded. In general, duration curves are developed from stream gage records at the site of interest. In many cases though, there is no stream-flow gage at the site of interest so the problem is to estimate a duration curve for the ungaged point. A method of estimating duration curves at ungaged points on regulated streams is described. This method was developed to predict duration curves on some highly regulated streams in the state of Idaho. The method was used in the Pacific Northwest Hydropower Resource Inventory. This method is most useful in areas where precipitation variation due to orographic or other effects are high - causing a simpler method of computing tributary inflow to be unsatisfactory. The method does require a set of regulated flows from reservoirs or other regulating structures and a good Normal Annual Precipitation Map is essential to the accuracy of the method. Because the method is simple, it is very easily computerized. Once the analysis technique is on computer, a large number of sites in very complex basins can be easily analyzed. If the proper data is available, this method can provide an easily applied and reliable method of computing duration curves at ungaged points in regulated streams.

18167 (CONF-791056—, pp 226-233) **Complexity of hydraulic problems in low-head hydroelectric developments.** Rudavsky, A.B.; Yuan, S.Q. (Hydro Research Science, Santa Clara, CA). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

Although one would assume hydraulic design problems and solutions for high dams would be more complex and difficult than the low dam developments, just the opposite is true. Due to the buffering effect of the reservoir behind a high dam and the independence between the headwater and tailwater levels in such structures, the range of flow conditions in high dams is much more predictable by analytical means and less complex than the hydraulics of low dams. The importance of modeling low-head hydroelectric developments before installation of the actual facilities cannot be over emphasized. Design parameters chosen for sediment transport, flood fluctuation, bed load movement, and ice blockage will be drastically changed after construction. The natural equilibrium of the river is destroyed and all the river dynamics are imposed upon the new facilities. Unforeseen parameters then arise which were not considered during the investigative studies, often forcing extensive and costly modifications to be made on the completed structure. One of the main objectives of the designer is to take into account the impact of the new dynamics of the low-head structure and maintain the natural river equilibrium as much as possible. This difficult task is much easier with the use of physical models. The modeling of river dynamics, spillway hydraulics, powerhouse hydraulics, and of vibrations in the mechanical equipment is briefly discussed. By using these models new equilibrium parameters can be evaluated and the designs modified for maximum efficiency prior to the construction stage. (LCL)

18168 (CONF-791056—, pp 234-257) **Hydrologic investigations for hydroelectric power.** Dalton, J.G. (Army Corps of Engineers, Dallas, TX); Franc, G.M. 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

Hydrologic investigations for the determination of hydroelectric power potential vary with the particular investigator and with the purpose of the investigation. The degree of sophistication and allowable expenditures depand upon the stage of the investigation as it proceeds from first thought, to reconnaissance level survey, to feasibility study, to advanced engineering and design, and to daily operational schemes for large systems of hydrologically and electrically associated water-management projects. Information is presented on the hydrologic techniques utilized in the US Army Corps of Engineers' National Hydroelectric Power Resources Study. This presentation is intended to summarize the hydrologic investigation techniques and the computer modeling techniques used in this study in order that others might assess the value of the study in meeting particular needs such as: specific interest in an individual site, assessment of regional or national potential, marketing surveys for equipment or services, planning of similar studies for other regions or nations, or for academic interest.

18169 (CONF-791056—, pp 260-264) **Research and development needs for alternative approaches to small hydropower.** Fritz, E.J. (Polytech, Inc., Cleveland, OH). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The state of the art for application of alternative forms of hydropower recovery, e.g., direct conversion of hydraulic mechanical power to thermal energy and the use of hydro-generated electric power to produce hot water or steam for industrial processes or district heating is discussed. The development of these alternative hydro energy recovery systems will depend on the cost and availability of fossil fuels, mainly imported oil, which are currently used for heating. (LCL)

18170 (CONF-791056—, pp 302-304) **Need for and application of micro-hydroelectric technology.** Maloney, T.J. (One Design Inc., Winchester, VA). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The need for harnessing small amounts of hydroelectric power available from streams traversing farms, and simple, inexpensive ways of doing this are discussed. (LCL)

18171 (CONF-791056—, pp 317-322) **Dam safety: an important factor in considering small-scale hydropower at existing reservoirs.** Dolcimascolo, A.R. (Tippetts, Abbett, McCarthy, Stratton, New York, NY). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

By May 1979, the US Corps of Engineers had inspected almost 3000 dams in the US and found 27% to be unsafe. The need for inspecting and assessing the safety of existing dams which are being considered for small hydropower development is discussed. Engineering evaluations of such dams should include hydrologic, hydraulic, seepage, stability, and structural analyses. The results of safety evaluations are an essential component in determining the

cost and overall feasibility of hydropower development at existing sites. (LCL)

18172 (CONF-791056—, pp 323-332) **Retired hydropower plant sites in the United States.** Jarecki, E.A.; McConnell, D.R.; Sligh, E.E. (Federal Energy Regulatory Commission, Washington, DC). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The role of the Federal Energy Regulatory Commission (FERC) in maintaining an inventory of existing and potential hydropower sites in the US in connection with the Commission's licensing and water resource development activities, and the types of data available from this inventory, including site characteristics and redevelopment potential, are discussed. Tabulated data on some of these sites are presented. Of 2316 retired plant sites identified, approximately 2200 plant sites which had an estimated capacity of about 1300 megawatts have some potential for redevelopment. This redevelopment possibility exists at sites where the dam, reservoir, and most of the major structures still exist to sites where the dam and major structures have been removed. Information on many of these sites is inadequate to make a conclusive classification. However, studies and construction activities for redevelopment are underway at some sites. (LCL)

18173 (CONF-791056—, pp 424-430) **Low-head hydroelectric evaluation and inventory.** Jacobs, N.J. (Water and Power Resources Service, Denver, CO). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

A 3 year study begun in 1979 to produce an inventory of the potential for low-head hydropower development in the 17 western states of the US is discussed in terms of activities to list existing sites, to evaluate the possibilities of additions to existing sites, to identify new low-head sites, and to estimate the power potential of low-head hydropower development of the area. (LCL)

18174 (CONF-791056—, pp 431-440) **Methodology for conducting a resource assessment of small-scale hydropower potential.** Klock, T.E. (New England River Basins Commission, Boston, MA). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The New England River Basins Commission (NERBC) has taken on the responsibility of furnishing New England with a resource assessment of the regions hydropower potential. The procedure selected for performing this assessment and for determining, in terms of energy and cost, the extent to which the region's oil dependency could be reduced by hydropower development are explained. (LCL)

18175 (CONF-791056—, pp 441-447) **Screening studies for small-scale hydropower potential.** George, A.C. (Tippetts-Abbett-McCarthy-Stratton, New York, NY). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

Methods are described that permit a rapid and inexpensive screening of a large number of dam sites to identify those potentially viable for small-scale hydropower development.

18176 (CONF-791056—, pp 448-450) **Interagency coordination for small hydroelectric power development in Alaska.** Baxter, L.R. (Corps of Engineers, Anchorage, AK); Opp, W.A. 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

Spiraling fuel prices, rising transportation costs, storage problems, and increasing energy demands - these are just a few of the factors which are making small hydropower increasingly more attractive as an alternative energy source. In remote areas of Alaska where heating fuel prices have soared to 2.50 per gallon and electricity rates of 35 to 40 cents/kWh are fast becoming the rule, the need for alternative energy sources is critical. These problems have become the primary catalyst in motivating state and Federal agencies involved with power development in Alaska to work cooperatively to fulfill these needs. With the help of Alaska's congressional delegation, the Public Works Committee of Congress passed a resolution in October 1976 directing the Corps of Engineers to assess the hydropower potential for small isolated communities throughout the state. This laid the groundwork for joint Federal-State cooperation between the four primary agencies involved in power development in Alaska. The Division of Energy and Power Development, the Alaska Power Authority, the Alaska Power Administration and the Corps of Engineers, are working together to avoid duplication of effort in meeting the problems and needs of the state of Alaska in a more timely and efficient manner. A brief description of each agency's role in power development is presented followed by examples of interagency coordination and the resulting programs for small hydropower development.

18177 (CONF-791056—, pp 486-491) **Tapping the boundless resource to solve energy problems.** Hamlin, R.E. (Michigan State Univ., East Lansing). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The problems related to the rehabilitation of small hydroelectric facilities and the potential of such rehabilitation for promoting the utilization of a boundless resource are described. First the background and history of both these aspects of hydropower are discussed with emphasis on how unemployment and small hydro potential are geographically and economically related. Then a how-to-do-it approach to project implementation is provided.

18178 (CONF-791056—, pp 504-517) **Three-agency control for co-dependent hydroelectric facility.** Barnes, S.E. (City of Columbus, OH). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The Columbus (Ohio) Division of Water (DOW) has two municipal water supply reservoirs on the Scioto River whose dams, built over 50 years ago, had provisions for installing hydroelectric facilities. The cost, hydrologic, and performance studies performed to establish the feasibility of now installing generating equipment are described, and the cooperative planning by the DOW, the Division of Electricity, and the Columbus and Southern Ohio Electric Company for installing, operating, and maintaining the hydropower plants, and for controlling, distributing, and charging for the electric power produced are discussed. (LCL)

18179 (CONF-791056—, pp 533-538) **Small-scale hydropower development: how New Hampshire is making it happen.** Klotz, L.H. (Univ. of New Hampshire, Durham); Manasse, F.K.; Master, D.B. 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

Activities since 1977 which have resulted in renewed interest in rehabilitating low-head hydropower facilities are reviewed. These activities include conferences on hydropower potential, the passage of state and national legislation related to hydropower development, use of DOE grants for feasibility studies, citizen's forums, and the development of hydropower associations so that independent members of the association can coordinate their development efforts. (LCL)

18180 (CONF-791056—, pp 575-583) **Preliminary feasibility study for hydropower at Brandon Road Lock and Dam.** Stadler, G.J. (Corps of Engineers, Chicago, IL); Moentenich, B. 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

A feasibility study for the installation of a hydroelectric power generating facility at the Brandon Road Lock and Dam near Joliet, Illinois is presented. Information is included on nearby hydropower plants, the existing dam, flow records, possible power plant designs, estimated cost, and economic analysis. The study concluded that the project could produce electric power at a reasonable cost, could furnish the equivalent electric requirement for 9000 homes in the Chicago area, and could result in conserving 117,000 barrels of oil annually. (LCL)

18181 (CONF-791056—, pp 591-596) **River basin code and mapping system for hydropower sites.** Jarecki, E.A.; Papsidero, T.F. (Federal Energy Regulatory Commission, Washington, DC). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The Federal Energy Regulatory Commission (FERC formerly FPA) has used a basin-wide planning approach in developing a river and site-coding system for maintaining pertinent information on the hydropower resources of the US. Over 14,000 streams and 5100 developed and potential hydropower sites have been coded and located on US maps. In use for over 30 years, this coding system has recently been revised and expanded to permit coding of up to 100,000 sites. The manner in which rivers are coded, the mapping system, and use of the hydropower site inventory are discussed. (LCL)

18182 (CONF-791056—, pp 597-602) **Engineering/economic model for evaluation of small-scale hydropower feasibility.** Limaye, D.R.; Hough, T.C.; Meroney, W. (Synergic Resources Corp., Bala-Cynwyd, PA). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The recent increases in the costs of oil and gas, declining availability of these fuels, and environmental impacts of using coal and nuclear energy, have improved the relative attractiveness of small-scale hydro. A 1977 study by the Corps of Engineers indicated that a large number of small dams are potential candidates for hydroelectric power development. Synergic Resources Corporation has developed a comprehensive evaluation framework for feasibility studies of small-scale hydropower. This paper describes the development of a standardized evaluation framework which can be used to evaluate the feasibility of small-scale hydropower development at existing dam sites; demonstrates the application of this framework by performing a feasibility study of hydroelectric power development potential at the Flat Rock Dam on the Schuylkill River; and performs a preliminary feasibility assessment of several other sites to estimate their development potential.

18183 (CONF-791056—, pp 603-605) **Support services for small hydroelectric projects in North Carolina.** Warren, J.L. (Research Triangle Inst., Research Triangle Park, NC). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

Activities to evaluate and promote the development of small hydropower projects in North Carolina are described. These include the establishment of an inventory of existing dams with small hydropower potential; analyzing institutional and regulatory factors affecting small hydro development in North Carolina; providing information, on-site reconnaissance surveys, and license application assistance to developers; and providing a coordination center for groups interested in small hydro development. (LCL)

18184 (CONF-791056—, pp 626-632) **Small-scale hydroelectric generation and the Salt River Project.** Lauerman, E.J. (Research and Future Projects Studies, Phoenix, AZ). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The method used for performing a cost-benefit analysis of installing generating facilities at an irrigation dam on the Salt River in Arizona is described. The feasibility is established by examining flow records, environmental effects, equipment and operating costs, and power market. Power generation at the site selected was deemed to be financially beneficial, and the hydro plant construction has begun. (LCL)

18185 (CONF-791056—, pp 667-669) **Federal reserved water rights: impact on small-scale hydropower development.** Fisher, G.J. (Dept. of the Interior, Washington, DC). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The numerous legal uncertainties about the effect of Federal reserved water rights on water usage and, in particular, of hydropower development, are briefly discussed. (LCL)

18186 (CONF-791056—, pp 670-674) **Procedures for evaluating national economic development (NED) benefits from Federal small-scale hydropower projects.** Johnson, J.F. (Water Resources Council, Washington, DC). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The proposed procedures for evaluation of national economic development benefits from Federal hydropower projects now being developed by the US Water Resources Council, with specific reference to small-scale hydropower projects are discussed. These procedures constitute the last and most detailed elements of the three-part Federal guidelines, the more general elements of which are known as the Principles and Standards for planning water and related land resources.

18187 (CONF-791056—, pp 675-680) **Overview of the National Hydropower Study: the value, potential, and role of hydropower as a future energy source.** Hanchey, J.R. (Army Corps of Engineers, Fort Belvoir, VA). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The National Hydropower Study being conducted by the Corps of Engineers, its purposes and goals, and the importance of hydroelectric power to an energy short nation are discussed. Based on preliminary information in the NHS computerized data base on both existing and potential hydropower sites, the amount of power that the US can expect from hydropower resources is estimated. This estimate will broaden to a more precise assessment at the end of the study. The process being used to accomplish the study, the activities to date and plans for the future are described.

18188 (CONF-791056—, pp 693-697) **Recent Congressional action affecting small-scale hydropower.** Glazer, S.J. (Congress, Washington, DC). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

Action in the US Congress on legislation related to small scale hydropower development is reviewed starting with 1978 legislation which provided Federal financial aid for the rehabilitation of existing dams. Activities of environmental lobbyists and proposed tax breaks for hydro developers are included in the discussion. (LCL)

18189 (CONF-791056—, pp 748-754) **Small decentralized hydropower for developing countries.** Grover, K. (GSA International and GTA, Katonah, NY). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The general method for evaluating the need for hydropower development in a developing country, procedures for determining the technical, social, economic and environmental advisability of such development, and the program used by the Agency for International Development to study the small decentralized hydro potential of Morocco are discussed. (LCL)

18190 (CONF-791056—, pp 755-762) **Role of small hydroelectric power generation in the energy mix development for the People's Republic of China.** Tseng, A.A.; Binli, D.; Wenshen, M.; Zhaoxiang, T. 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The history of energy consumption in China, and the development since 1958 of 80,000 small or micro-hydropower plants with a total capacity of 5400 MW are reviewed. The status of turbogenerator equipment for small-scale plants and the objectives of future small hydro development are discussed. (LCL)

18191 (CONF-791056—, pp 796-801) **Small hydro: a viable alternative now.** Gladwell, J.S.; Warnick, C.C. (Univ. of Idaho, Moscow). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The world-wide need for developing small-scale hydropower in order to conserve nonrenewable energy sources, particularly petroleum and the need to educate people to whom the development of hydropower would be especially advantageous are discussed. (LCL)

18192 (CONF-791056—, pp 520-526) **Planning small-scale hydropower additions.** Davis, D.W. (Army Corps of Engineers, Davis, CA). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

Small-scale hydropower development is receiving significant renewed attention as one of the nations, underdeveloped energy resources. Public institutions and private organizations are examining the potential that exists at many existing reservoir sites presently not producing power. To aid these groups in their efforts, the Hydrologic Engineering Center of the Corps of Engineers has prepared a manual providing guidance in the study of the feasibility of adding small hydroelectric power features to existing facilities. The manual is designed for use by public agencies (Federal, state and local), public and private utilities, and private investors. The focus is upon the technology, concepts, and economic and financial issues unique to small-scale hydropower additions. The manual includes data and discussions on the topical subjects of cost escalation in economic and financial analysis, feature component selection for reconnaissance and feasibility levels of study, and time, costs, and resources required to perform the investigations. Significant findings and conclusions of studies that were performed for the project and an overview of the manual are presented.

18193 **(DOE/IR/05106—T38) Columbus moves to develop low-head hydro potential.** (Public Technology, Inc., Washington, DC (USA)). May 1980. Contract FG02-78IR05106. 2p. NTIS, PC A02/MF A01.

A study, conducted to determine the feasibility of hydropower generation at two water storage dams owned by the city of Columbus, Ohio, is discussed. The study concluded that power development at these sites is technically, environmentally, and economically feasible. Construction plans are being developed for one site with project completion scheduled for mid 1983. (LCL)

1303 Plant Design And Operation

REFER ALSO TO CITATION(S) 18169, 18170, 18180, 18190, 18228, 18763, 18765, 18766, 18767

18194 (CONF-791056—, pp 89-98) **Small-hydro control and operation.** Mayo, H.A. (Allis-Chalmers, York, PA). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

A number of small-hydro installations have been constructed during the last twenty years with simplified, automatic control systems. The primary load controls in each case are the runner blades with an intake gate or valve provided for tight water shutoff. Generator controls and system protection are part of the system. A number of these specific installations for diverse applications are reviewed.

18195 (CONF-791056—, pp 99-107) **Development concept for Kaplan tube-turbines.** Hartmann, O. (Motor-Columbus Consulting Engineers, Inc., Baden, Switzerland). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

Low-head hydro is handicapped by the fact that large quantities of water must be handled for relatively little power. Dimensions are large and, consequently, civil construction and equipment are expensive per unit of power. If small capacity is added to low-head things get even worse. First, cost limitations are at least as stringent as with large capacity installations. In addition, operation and maintenance are becoming a disproportionate heavy burden. If capacity falls below one megawatt, the cost of only one full-time employee may be critical for the plant economy. In developing countries the situation may be different, but not better; labor may be cheap, but skilled labor is scarce. Automatic operation under normal conditions presents no problem, but a certain amount of maintenance, inspection, cleaning and repair work remains and should, if possible, not require special skills and equipment. The ideal small, low-head plant should not only be of low first cost but also of simple design. It should be easily accessible in all critical parts, to enable the average mechanic to understand its function, detect faults and perform repairs. The ideal small low-head machine should be able to digest some debris in the water, to live on low maintenance and to survive even maltreatment without great damage. The low-head, small-capacity concept presented here is an axial through-flow turbine with rotating rotor tube assembly, with the runner blades held in the rotor tube which offers mechanical and hydraulic advantages, and is an attempt to meet these objectives.

18196 (CONF-791056—, pp 108-115) **Small-scale hydro: the use of pumps as turbines.** Lawrence, J.D. (Acres American Inc., Buffalo, NY). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The technology of using standard pumping equipment as hydraulic turbines in low-head hydropower plants is discussed in terms of operating characteristics, performance and economics. (LCL)

18197 (CONF-791056—, pp 116-141) **Modernization of hydroelectric units.** Wachter, G.F. (Allis-Chalmers Corp., York, PA). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

Data are presented on the measures taken and improved generating efficiencies achieved by upgrading existing hydrogenerating plants with new or rehabilitated turbogenerator units. The need for carefully evaluating the existing condition before beginning a modernization program is stressed. It is concluded that there exists in many of today's operating hydro installations, the opportunity to increase the capacity and/or energy by applying technological advances in hydro equipment design of the past 20 to 30 years. Units that have operated for over half a century are being rehabilitated to provide additional energy at costs that can be economically justified. Although the contribution to the nation's increasing energy requirements from modernization of existing hydrogenerating units may be a small percentage of the total energy requirements, it certainly is a step in the right direction.

18198 (CONF-791056—, pp 142-151) **Ossberger cross-flow turbines.** Stapenhorst, F.W.E. (F.W.E. Stapenhorst Inc., Pointe Claire, Quebec). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The design, operation, and controls of the Ossberger cross-flow turbine which can operate with heads as low as 3 ft up to heads of several hundred feet, and the suitability of this turbine for small run-of-the-stream operation are discussed. (LCL)

18199 (CONF-791056—, pp 154-156) **Redevelopment of older hydroelectric generating plants: a three-phase approach.** Trott, A.G. (Power Design Services, Inc., Lombard, IL). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The growing interest in restoring and upgrading many old and inefficient hydroelectric generating plants is the result of rising power plant fuel costs, the recognition of the regenerative nature of hydropower, and the nonpolluting attributes of hydropower. A three-phase approach to the investigation of such restoration and upgrading should include: site information or hydrologic studies; feasibility and economic evaluation; and engineering and design. Careful planning using these steps should minimize the financial risks of restoration projects. (LCL)

18200 (CONF-791056—, pp 176-184) **Energy losses at hydroelectric powerplants.** Purdy, C.C. (Tippetts-Abbett-McCarthy-Stratton, New York, NY). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

A method is presented for identifying energy losses and determining the overall efficiency of existing and proposed hydroelectric facilities. (LCL)

18201 (CONF-791056—, pp 185-195) **Review of induction generators and their application to small hydroelectric power plants.** Slapp, J.; Hingorani, N.G. (Electric Power Research Inst., Palo Alto, CA). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The suitability of induction generators as simple, reliable, low maintenance machinery for small scale hydropower developments is discussed with information on the theory and performance of induction generators. It is concluded that the induction generator can make a substantial contribution to energy production in the US and other countries in small hydroelectric stations with generators rated up to 10,000 kW. The induction generators when connected to an asynchronous intertie will allow hydraulic resources to be developed where the water flow is erratic. Such a system may also have advantages in allowing a wider range of operation in tidal power application. Furthermore, such a generator is well suited to bulb turbines. (LCL)

18202 (CONF-791056—, pp 196-201) **Calculations of circuit breaker closing criteria for synchronizing a generator.** Beckwith, R.W. (Beckwith Electric Co., Largo, FL). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

It is well known that damage to a generator, and possibly to associated transformers, can be caused by the phase and frequency error which will always exist to some degree just as the circuit breaker is closed. This damage can range from the accumulated effects of many synchronizing and fault-induced force transients, incurred over a period of years, to a spectacular failure as a result of a single significant synchronizing error. Present technology can be depended on to eliminate the possibility for a catastrophic synchronizing error. It is less certain that incremental damage will always be eliminated. Extremely precise automatic synchronizers exist which are capable of reliably eliminating even incremental damage, but simple analytical criteria for their safe adjustment have not heretofore been available. Previous work has been directed toward the power-torque transient with precise mathematical modeling of a particular machine. There is a need for a simpler mathematical model which may not be as accurate but can easily be applied to any generator. To meet this need, it must be established that the resulting equations and method of application fail in accuracy in the direction safe to the machine. A solution to this problem, or at least a start in that direction, is proposed. By using energy equations, simple criteria for setting phase angle and frequency difference for synchronizing are established.In addition to the simplicity, the equations generated here relate the frequency difference and phase error in more detail and probably with greater accuracy. The results were useful for machine design but did not immediately lead to a safe setting of synchronizing phase angle error.

18203 (CONF-791056—, pp 202-207) **Packaged electrical equipment for mini-hydropower stations.** Bergseng, J. (A/S Norsk Elektrisk Brown Boveri, Oslo, Norway); Besel, H.J.; Riezinger, F.; Butz, H. 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

A modern electrical concept for mini-hydropower stations is discussed. A comparison between induction and synchronous generators is given which shows their operation on the grid and also gives recommendations for the optimum production of kWh. From the viewpoint of unmanned operation, the switchgear and control system as well as the precise regulation of the water level are described. An example of the upgrading of an existing mini-hydropower station is given with data.

18204 (CONF-791056—, pp 265-272) **Concepts for small-scale hybrid solar-hydroelectric powerplants.** French, R.L. (American Technological Univ., Kileen, TX); Miller, K.T. 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

A hybrid small scale power system is described which uses a conventional hydro subsystem for generating electric power and a solar subsystem is used for pumping water to an elevation from which it can be used in the hydro subsystem. The pumps can be driven by a solar-thermal heat engine or by an electric motor running on solar-generated electricity. The conceptual design of the solar subsystem is discussed. Preliminary studies of hybird solar-hydroelectric powerplants indicate that the hybird system concept has considerable potential, and that the solar and hydro subsystems of a hybrid would be highly complementary. In particular, solar subsystems for recycling discharge water and thus storing solar energy would enable more effective utilization of hydroelectric generating capacity. The output would be increased during periods of low flow, and the intermittent availability of solar radiation for electric power generation would be ameliorated by the pumped storage inherent to hybrid systems. Further studies are also required to define the methodology and the best technical approach for the solar subsystem design under different conditions. Detailed lifecycle cost studies considering realistic future cost scenarios should be included. (LCL)

18205 (CONF-791056—, pp 273-301) **Schneider engine: performance and applications for hydropower.** Schneider, D.J.; Damstrom, E.K. (Schneider Lift Translator Co., Justin, TX). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The design, operation, and use are explained of the Schneider Engine, a lift translator consisting of hydroofils on a vertically moving belt, whose linear motion is converted to rotational motion of the axels at each end of the belt travel. The operating characteristics of Schneider engines are compared with those of hydraulic turbines. The major technical and economic advantages of the Schneider engine facility are to: operate cost-effectively at heads as low as even ambient flow (i.e., ocean and tidal currents) where rotors are absolutely not cost-effective; operate at low heads where discharges are very large, i.e., the Mississippi River; markedly reduce costs of power produced at settings of sufficient head for rotors to operate albeit at high cost of manufacture, instal!ation, operation and maintenance, i.e., head below 50 ft; and integrate the slope of rivers in small increments to produce collectively large quantities of power comparable to high head installations, but without inundating valuable land. Applications of Schneider engines to low-heaed hydropower developments are discussed. It is recommended that very serious study of this low-cost, technologically advantaged, low-head alternative to massive river basin flooding ought to be given extensive, serious study and major trial.

18206 (CONF-791056—, pp 306-316) **Small-scale hydropower application of hydroelectric mini-units.** Sattler, H. (Voest-Alpine AG, Linz, Austria). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

As a result of the continuous search and pressing need for alternative energy sources, the utilization of small-scale hydroelectric power is more widely considered and applied throughout the world. This trend has prompted the development of standard-type hydroelectric mini-units. The different types and application of these mini-units are discussed in this paper.

18207 (CONF-791056—, pp 382-387) **Vertical hydraulic ram: a low-head, high-flow device for power development. Design outline for a 1000 kW plant for a six-foot head.** Baird, H. 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The design and operation of a vertical hydraulic ram for producing very low heads which could then be used in low-head hydropower plants is briefly discussed. (LCL)

18208 (CONF-791056—, pp 388-393) **Hydroelectric development, without dams, reservoirs, and penstocks.** Hoffman, P.R. (Hydroelectric Mini-Micro Hydro, Los Angeles, CA). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

A micro-scale hydropower generating scheme is proposed which uses the pipe flow at a water pressure regulating station in a municipal water supply system for generating electric power. The energy conversion can be accomplished using a centrifugal pump as the hydraulic turbine and a simple generator. The electric power is generated at the local distribution voltage level and fed direct to the nearest power pole. In systems with flows of 50 Cfs (max) to 5 Cfs (min) the average output would be 500 kW. A rough economic analysis shows the system would be cost effective. Also, it uses an energy source almost universally available beneath public streets, and represents an energy recovery development which has no adverse environmental effects. (LCL)

18209 (CONF-791056—, pp 394-399) **Appropriate technology in hydropower.** Tegtmeyer, R.D. (Patents and Trademark Office, Washington, DC). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

Appropriate technology in patents for small-scale hydropower systems, and patents generally as a source for appropriate technology in all fields are discussed. Information is included on: what is the nature of information contained within patents; how one can access patent information; the extent to which hydropower technology is covered by patents; and the trend in hydropower patenting activity. (LCL)

18210 (CONF-791056—, pp 460-463) **Powerhouse restoration at Hagley.** DeHeer, L. (O'Brien and Gere Engineers, Inc., Philadelphia, PA). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

A short history is presented of one of the early small-scale hydropower installations in the US, the Hagley hydropower plant built during the 1890's on the Brandywine River, and experiences associated with the restoration and upgrading of this facility, begun in 1975, are described. The powerhouse was placed in service in October 1976, and has a maximum output of 220 kW which is being upgraded by modifications to the dam and canals to achieve an output capacity of 350 kW. (LCL)

18211 (CONF-791056—, pp 464-484) **Idaho Falls Low-Head Hydroelectric Demonstration Project.** Chavez, P. (Idaho Falls Hydroelectric Project, ID). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The Idaho Falls Project consists of the redevelopment of three existing run-of-river power plants and associated diversion dams on the Snake River near Idaho Falls in Eastern Idaho, using bulb turbine-generators. The gross head at each of the plants is approximately twenty feet. All three plants are owned and operated by the city of Idaho Falls. Under a cooperative agreement signed in January 1978, by the US DOE and the city of Idaho Falls, DOE agreed to participate and assist in the project. It is a principal feature of DOE's national Low-Head Hydroelectric Demonstration Program. The objectives of this demonstration project are: (1) for the city to increase energy generation at their three hydroelectric plants and (2) for DOE to obtain detailed information on an existing technology that may have applicability to the development of the nation's low-head hydro reserves. Financing available for the project consists of $48 million of revenue bonds authorized by the city and $7.3 million obligated by DOE. The most unique thing about this project is that small bulb units were selected for installation at these sites. The three Idaho Falls units will be 8 MW each. The first unit is expected to go on line in December 1981. The feasibility study conducted for this project is discussed with data on hydrologic conditions, operational characteristics, and costs. (LCL)

18212 (CONF-791056—, pp 539-548) **Optimization of Civil Works design for small-scale hydropower projects.** Broome, K.R. (Gilbert Associates, Inc., Reading, PA); Mayo, H.A. Jr. 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

A systematic method of selecting the lowest cost approaches to the design of the civil works for small scale hydropower projects at existing dams is described. This method recognizes the inherent diversity of site conditions, and considers a full range of options for siting, water ways, equipment sizes and configurations, and housing. This method is used to determine whether the necessary equipment can be installed at a particular site and if the overall renovation of a site is financially feasible. (LCL)

18213 (CONF-791056—, pp 568-574) **Case study: Broadwater Dam Power Project, Missouri River, Montana.** Little, G.E. (Tudor Engineering Co., San Francisco, CA). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

Studies that were conducted to determine the optimum plant design and optimum size of equipment for a low-head hydropower plant proposed for installation at the existing Broadwater Dam on the Missouri River near Toston, Montana are described. An apron-mounted configuration was recommended as the most desirable installation for this dam and would cost 12% less than a conventional installation. The state of Montana is proceeding with development of the recommended plant design. (LCL)

18214 (CONF-791056—, pp 586-590) **Study of factors affecting feasibility of low-head hydroelectric generation.** Bates, E.R. (Dept. of Energy, Lakewood, CO). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The technical and economic factors which affect the feasibility of developing low-head hydropower plants are briefly reviewed. The items discussed include available head, development of low-head generating equipment, European use of low-head power, and legal-institutional aspects. (LCL)

18215 (CONF-791056—, pp 608-616) **Potential hydropower development for vertical turbine-spillway combine.** Chow, W.Y.; Rudavsky, A.B. (Hydro Research Science, Santa Clara, CA). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The design, investigation, model studies and development of the vertical low-head turbine-spillway combine structure located at Broadwater Dam in Montana are discussed. The project's overall goal was conversion of 4 to 6 of the 14 existing spillway bays into power bays.

18216 (CONF-791056—, pp 633-642) **Weed Hydroelectric Development: a small-hydro case study.** Calvert, J.D. Jr. (Gilbert/Commonwealth, Jackson, MS). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

A small hydropower development of 630 kW successfully undertaken in the village of Gresham, Wisconsin in 1965 is described. Information is included on feasibility studies of the power potential and costs, licensing, financing, environmental effects, design, contracts, construction, and overall costs. Based on energy costs at the time it was built, this was only a marginally economic undertaking. At today's energy costs this plant shows substantial savings as compared with power generation by fossil-fuel plants. (LCL)

18217 (CONF-791056—, pp 764-775) **Modern small-scale hydro turbines.** Romcke, N.H. (Soerumsand Verksted A/S, Norway). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The design, fabrication, and performance of small-scale Francis and tubular turbines for hydropower plants are discussed,

and the program at Soerumsand Verksted A/S (Norway) to develop cheaper small turbines with no reduction in turbine efficiency or quality is described. (LCL)

1304 Regulations And Licensing

REFER ALSO TO CITATION(S) 18167, 18179, 18759

18218 (CONF-791056—, pp 662-666) **Development of a small-scale hydroelectric project: policy and political considerations, Broadwater Dam, Montana.** Bondy, R.L. (Montana Department of Natural Resources and Conservation, Helena). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The state of Montana owns the Broadwater Dam and a reservoir which is used for controlling water supply. The reservoir is managed by the Department of Natural Resources and Conservation (DNRC). The Vigilante Power Cooperative needs additional sources of electric power, and sees hydropower development at Broadwater as a relatively inexpensive source. The struggle between the Vigilante Power Cooperative and DNRC over who should have the right for power development at this site is described with references to legislative actions, financing opportunities available to both parties, and options available to the Cooperative for conserving power or getting it from other sources. As a result of this conflict, DNRC developed eight specific policy recommendations for the addition of hydropower facilities at state-owned water projects. It is believed that implementation of these recommendations can help provide the needed electric power and retain a safe water conservation program. (LCL)

18219 (CONF-791056—, pp 738-742) **Tale of two Federal systems: Canadian-American law on hydroelectric development.** Brown, P.W. (Franklin Pierce Law Center, Concord, NH). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The regulatory systems of two Federal systems of government - Canada and the US - are briefly examined. The purposes of the paper will be to identify certain similarities and differences in approach by hydroelectric development in each country and attempt to assess the potential benefits of different forms of regulation in Canada to the US experience. For purposes of simplifying the analysis and meeting space limitations, the Province of Ontario has been chosen as an example of a provincial regulatory system. The first question posed in this paper is why, with the vast amount of statutes, cases and regulations concerning the regulation of hydroelectric development in the US, should another system be examined. The question almost answers itself. The vast amount of regulation in the US may, in fact, be one of the largest impediments to small-scale hydroelectric development (SSH). The regulatory system certainly increases the amount and cost of needed information and may impose costs on developers which are out of proportion to the external costs imposed by redevelopment of existing sites. The important result is to reform the American system so that transaction costs are kept to a minimum and proper account is taken of the external costs of SSH developments.

1305 Economics And Management

REFER ALSO TO CITATION(S) 18156, 18159, 18161, 18177, 18180, 18184, 18189, 18191, 18192, 18193, 18210, 18211, 18212, 18216, 18760

18220 (CONF-791056—, pp 157-162) **Small-scale hydroelectric development at existing public projects.** Steiner, D.E.; Stritt, A.R. (Army Corps of Engineers, Cincinnati, OH). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

Formulation of economically viable and socially acceptable plans for development of small-scale hydro at existing public projects presents an opportunity for innovative design and operational concepts. During this process, the planning and design team must recognize that the ultimate client for hydroelectric development at public projects is the broad public interest. In general, clients' requirements are complex and often vaguely defined. This paper presents the authors' point of view for defining and pursuing the public interest objective in terms of several key parameters. These parameters are: cost-effective design of hydroelectric appurtenances with particular emphasis on hydraulic conveyance facilities; functional and operational constraints on hydroelectric additions to multiple purpose projects; an analysis of existing and projected regional electric supply and demand characteristics; a reordering of traditional economic objectives to emphasize conservation; and opportunities to match seasonal variations in reservoir operation requirements with variations in electric supply and demand characteristics. The data base for the illustrations and quantitative evaluations presented in this paper include published information of the East Central Area Reliability Coordination Agreement (ECAR) and data evolving from preliminary studies of small scale hydroelectric additions to 20 multiple purpose reservoirs within both the Ohio River Basin and the ECAR area. These 20 multiple purpose reservoirs encompass a variety of drainage and head conditions, types of dams and appurtences, and project purposes.

18221 (CONF-791056—, pp 333-339) **Minimizing capital cost in small-scale hydro development.** Vanderburgh, M.R.; Willett, D.C. (Acres American, Inc., Buffalo, NY). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The development of small scale hydro sites is a capital-intensive investment. Cost-saving measures that can be adopted to reduce capital costs and the impact of these measures on the ultimate cost of the facility are discussed. Cost-savings measures applicable to site investigations for determining project feasibility, to the selection of equipment, and to power plant design are briefly described. (LCL)

18222 (CONF-791056—, pp 342-349) **Basic economic comparison of small-scale hydroelectric busbar costs.** Searls, J.P. (Dept. of Energy, Washington, DC). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The competitive position of electrical generation by small-hydro technology is examined. The first part of the study is an analysis of historical cost trends of three component parts of the smaller sizes of hydroelectric generation plants. The second part continues with a comparison of small-hydro busbar costs to the busbar costs of alternative technologies by availability and capacity factor. This comparison shows that, depending on site-specific qualities, small-hydro is competitive with alternative technologies. The historical costs of three subdivisions of the total small-hydro site cost are studied, and the effects of various types of developers on the fixed annual charge rate that has to be levied to pay back development money, taxes, depreciation, and insurance are examined. The summation of this charge rate and the yearly operations and maintenance charges, when divided by the total kWh of generation per year, sets the busbar costs in mills per kilowatt-hour (mills/kWh) where a mill is a tenth of a cent. With busbar costs and capacity and capacity factors one can compare the competitive position of small-hydro to those of competitive technologies. For this study, sites in FERC's Region I (New England Region) were chosen with sizes from 11.3 MW to 140.4 MW and start-up dates between 1929 and 1974. All sites are utility owned. The cost data for each dam was put into three categories:dam and dam site; structures and improvements; and turbines, generators, electrical and miscellaneous equipment. Since this study is primarily concerned with rejuvenated hydrosites, the turbines, generators and electrical equipment category and the structures and improvements category are given the most attention.

18223 (CONF-791056—, pp 350-360) **Economic evaluation of small-scale hydropower plants.** Goodman, A.S.; Brown, R.S. (Polytechnic Inst., Brooklyn, NY). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The experience of investigators at the Polytechnic Institute of New York in applying generalized techniques of economic anal-

ysis to an inventory of existing and potential hydropower-sites in the State of New York is discussed. The study included preliminary technical assessments of the sites in the inventory and preliminary cost estimates for a large number of the projects. Criteria have been formulated for classifying hydropower sites in various time frames according to their prospects for development. The study also included the preparation of a developer's manual with a suggested approach for a preliminary determination of whether a feasible project is likely, and whether to proceed to more detailed studies. The developer may be an entrepreneur, municipality, manufacturer, or electric utility.

18224 (CONF-791056—, pp 361-367) **Conceptual economic model of small-scale, run-of-river hydroelectric facilities.** Lystra, D.W. (Ayres, Lewis, Norris and May, Inc., Ann Arbor, MI). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The sizing of hydroelectric equipment in relation to available streamflow is a matter which is often given too little attention in engineering feasibility studies. Often the influence of equipment ratings on project economics is severely underestimated and turbine and generator capacities become fixed at the very earliest stages of study. In fact, however, the selection of turbine and generator capacities has a major impact on project cost-effectiveness, often far greater than the impact of other design parameters, when so many available dam sites are limited to a run-of-the-river operating mode. In these instances, the selection of equipment capacities in relation to stream discharge can be absolutely critical, frequently making the difference between a project which is economically worthwhile to develop, and one which is economically not worthwhile to develop. The important relationship between equipment capacity and project economics is illustrated by developing a conceptual model of small-scale, run-of-the-river hydroelectric facility economics. It is shown how available waterpower can be visualized by use of what hydrologists call the flow-duration curve. Then the relationship between equipment rating and the projected-power output at a typical dam site is described. Project costs and revenues as functions of plant size, and their relationship to benefit/cost ratios are discussed. Finally, a brief case study example is presented that will hopefully make clear how optimum equipment can be determined in a real-world situation.

18225 (CONF-791056—, pp 368-376) **Comparative project economics of small-scale hydropower.** Satir, K. 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The economics of power generation by small-scale hydro plants are compared with coal-fired and nuclear thermal power plant generating costs and with trends in the wholesale cost of electric power. Cost items from the initial planning phase of a facility through design, equipment acquisition, capital acquisition, to the plant operation are considered. It is concluded that although the development of small hydropower is more costly than might be expected, recent trends indicate that such projects are becoming feasible, and that over a 40 y payout period at 10%/y interest rate hydro generated power will cost considerably less than power generated by thermal power plants. (LCL)

18226 (CONF-791056—, pp 452-459) **Feasibility investigations of five low-head hydroelectric projects under Department of Energy grant program.** Williamson, J.V.; Pietz, A.W. (R.W. Beck and Associates, Seattle, WA). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

In 1978 the US Department of Energy (DOE) made grants to study the feasibility of installing hydroelectric generating facilities at some 54 existing dams throughout the country. The results of the feasibility studies for five of these sites are presented. These five sites are representative of the varying conditions which can be encountered in attempting to develop small-scale hydropower at existing dams in the US. The proposed sites range in location from Kansas to Florida, and occur on small to large rivers. Further, the developable head ranges from about 2.5 meters to 20 meters and the installed capacity from 400 kW to almost 15,000 kW. Two of the projects are located at Corps of Engineers dams; two are at installations which have, or have had, hydroelectric power generation in the past; and the other is at a dam which impounds a thermal plant cooling pond. The methods of financing available range from tax exempt municipal revenue bonds to Rural Electrification Administration (REA) type financing. The alternatives to a project are either continued wholesale power purchase or construction of new thermal generation, depending on the location. The projects also cover a range of equipment characteristics and arrangements. This includes both horizontal and vertical mountings and types of turbines which include Francis, fixed-blade propeller, adjustable-blade propeller, and diagonal flow. In addition, the settings include Allis-Chalmers standard TUBEs, modified open flume, and concrete spiral case.

18227 (CONF-791056—, pp 527-532) **Marketability of low-head hydropower.** Lee, S.T. (Systems Control, Inc., Palo Alto, CA); Grimsrud, G.P.; Chan, M.L.; Marsh, E.; Masters, G.H.; Threadgill, J.R.; Watts, A.W. 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

In order to evaluate the potentials of low-head hydropower, a market study of the demand side must be done. Such a study involving, first the selection of 4 geographically-dispersed areas in the US that offer the most potential, and, second, a detailed study of the economic value of developing that potential, is described. A computer model, PUPS (Planning Unconventional Power Supplies) was used for estimating the market value of low-head hydropower. The results are presented in terms of break-even capital cost, benefits due to spinning reserve contribution, savings in transmission and distribution costs, and the relative effects of fossil fuel cost escalation and of interest rate drop on the economics of hydropower plants. (LCL)

18228 (CONF-791056—, pp 561-567) **Case study: Rollins Power Project, Bear River, California.** Willer, D.C. (Tudor Engineering Co., San Francisco, CA). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The construction and financing of the Rollins Hydroelectric Project in California are described. This 11 MW unit used an existing irrigation dam, had a total cost for engineering, construction, legal and financial consultations, and interest during construction of $8,514,000 or $774/kW, and was built by a partnership of an irrigation district and an investor-owned utility with no assistance from Federal, state or loan funds. (LCL)

18229 (CONF-791056—, pp 652-656) **Municipal financing of small-scale hydropower.** Hobart, L. (American Public Power Association, Washington, DC). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

Methods for financing small scale hydropower projects within publicly-owned electric utilities include conventional means such as general obligation bonds and revenue bonds, and less conventional municipal financing such as retained earnings, leasing, short term notes, commercial loans, and Federal government loans and grants. Examples are given of the use of these financing methods by various US towns and cities. (LCL)

18230 (CONF-791056—, pp 657-660) **Financing of small-scale hydropower.** Tuttle, G.L. (City of Paterson, NJ). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The method used by the city of Paterson, NJ, to finance its $9 million Great Falls hydropower project is discussed. The steps used in this financing process included establishing the legality of issuing tax exempt bonds and the ability to repay revenue bonds, and study of the contractural obligations. It is concluded that tax-exempt bond financing is likely to provide a large part or all of the capital financing required to develop most small hydropower sites. Thorough review of the available tax-exempt options in conjunction with local needs and revenue potential can make the difference

between a feasible and unfeasible project, and can minimize the risk ultimately accepted by the local unit. Moreover, selection of the most appropriate option may enhance the potential profitability of an already feasible project. (LCL)

18231 (CONF-791056—, pp 700-707) **Analysis of institutional, economic, and environmental restraints on hydroelectric development at existing dams.** Taylor, R.J. (Johns Hopkins Univ., Laurel, MD). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

A method developed to quantify the impact of institutional, economic and environmental restraints on hydroelectric development at existing dams is described. The results of this method are used to plot the change in potential hydroelectric power supply within a designated area as a function of the incremental costs of hydroelectric development. Factors accounted for in this analysis include the costs of equipment, capital, taxes, insurance, and licensing. Using 52 nonhydroelectric dams in Pennsylvania as an example, it is estimated that if the cost of the powerhouse and equipment can be reduced by 30% and the price of electricity to the developer is 3 cents/kWh or less, the hydroelectric power supply can be increased by 77%. (LCL)

18232 (CONF-791056—, pp 708-710) **Private financing of small-scale hydro projects.** McLeod, H.W. (New England Merchants National Bank, Boston, MA). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The key components of successful small-scale hydroelectric project financing, the types of financing required, and possible financing sources are briefly described. (LCL)

18233 (CONF-791056—, pp 711-714) **Electricity generation in rural areas: a future for small-scale hydro projects.** Telaar, W.B. (Dept. of Agriculture, Washington, DC). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The role of the Rural Electrification Administration in providing technical and managerial assistance and loans to small rural utilities in general, and activities of the REA encouraging small hydro developments that have a sound technical, financial and organizational basis are discussed. (LCL)

18234 (CONF-791056—, pp 617-625) **Small-scale hydro simulation program.** Mankauskas, J.J. Jr.; Wright, E.S. (United Technologies Research Center, East Hanford, CT). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

Traditionally, small-hydro projects have been evaluated by rule-of-thumb analysis. Stream-flow duration curves were established from actual or extrapolated US Geological Survey Data, the working head established, and a plant capacity factor assumed. Average values of efficiency, value of power, etc., were used to establish estimated feasibility, and the evaluation of variations which might occur was limited to those which were easily calculable. Obviously, such procedures have little value in today's energy market where a high premium must be placed on the cost-effective generation of electricity from indigenous, renewable resources. Modern-day energy systems analysis incorporates many powerful tools to ensure system optimization in a wide variety of applications. Therefore, it is believed that a comprehensive computer program should be developed for accurate analysis of small-hydro sites. Consequently, an effort was devoted to the development of the Small-Hydro System Optimization Program (SHOP). This paper presents the program's systems analysis capabilities and presents an overview of the program's structure and operation.

18235 (DOE/CE/04934—44) **Financing of private small scale hydroelectric projects.** Smukler, L.M. (Franklin Pierce Law Center, Concord, NH (USA). Energy Law Inst.). Mar 1981. Contract AS02-78RA04934. 107p. NTIS, PC A06/MF A01.

This manual is a description of the financing process associated with the private development of SSH projects. It examines the institutional framework and the actors within that framework who will have vital impact upon the potential for success of a project. The manual describes the information a developer should obtain in order to make intelligent decisions concerning the multiple directions in which project development can proceed. This information should assist the developer in formulating a business plan. Factors to be considered in choosing a business organizational form are discussed. Included is an analysis of the federal income tax factors relevant to SSH in context of the treatment of specific items: business expenses, depreciation, the Investment Tax Credit, and the Energy Tax Credit as modified by COWPTA. In addition, the tax and organizational factors are applied to an analysis of two mechanisms which can lower development costs through maximum utilization of available tax benefits: limited partnerships and leveraged leases. The manual lists and analyzes the major sources of debt and equity financing that are potentially available to a developer. Finally, all the previously discussed pieces are put together and how the decisions relating to such factors as marketing, taxation and debt financing interrelate to determine the probable success and profitability of a project are investigated. Furthermore, this part of the manual will provide an illustrated guide to understanding the financing process, leading the reader through the decisionmaking and negotiation points, and highlighting what should be borne in mind, what a developer may be giving up and what the perspective of other key actors will be at those points.

1306 Environmental Aspects

REFER ALSO TO CITATION(S) 18161

18236 (CONF-791056—, pp 404-410) **Community and social impacts from hydropower development.** Clemence, S. (Army Corps of Engineers, Seattle, WA). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The adverse social impacts of the construction of a hydropower plant near a small town in Washington and methods for avoiding such impacts by community involvement in the planning for such facilities are discussed. (LCL)

18237 (CONF-791056—, pp 492-497) **Environmental impact assessment methodology of small-scale hydroelectric projects.** Carlisle, R.K.; Lystra, D.W. (Ayres, Lewis, Norris and May, Inc., Ann Arbor, MI). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

In 1978, Ayres, Lewis, Norris and May, Inc. was selected by the US DOE to study the feasibility of recommissioning two small-scale hydroelectric facilities located on the Huron River in southeastern Michigan. A necessary component of the DOE studies was the evaluation of the environmental impact of hydroelectric development at subject sites. The methodology used to evaluate the environmental impacts of the small-scale hydroelectric facilities is described. Further, the actual application of the environmental impact assessment methodology to a case study project is discussed. The procedure described has been found adequate to address environmental issues associated with the restoration of small-scale hydroelectric facilities. The environmental impact matrix can be of assistance in identifying activities associated with restoration and the environmental factors potentially impacted. Further, the matrix provides a useful tool for initial screening of relative environmental impacts. The experience in conducting the feasibility studies at three hydroelectric sites indicates that the identifiable adverse environmental impacts associated with restoration of the three facilities are relatively minor. Significant environmental issues which have been identified, such as impoundment management, are largely independent concerns. The analysis of the small-scale hydroelectric sites has focused attention on facilities which have been abandoned and largely ignored. The conduct of the feasibility studies has forced the consideration of a host of dam-related environmental concerns which otherwise would not be addressed.

18238 (CONF-791056—, pp 688-692) **Land use and small-scale hydropower: an overview of environmental impacts and institutional responses.** Plantico, R.C. (Fish and Wildlife Service, Kearneysville, WV). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

Studies conducted by a variety of agencies and organizations indicate that small-scale hydropower (SSH) has the potential of making significant contributions to the nation's energy base (Clapp and Garner). Project development - whether it involves the rehabilitation of old dam sites or the construction of new sites - can be constrained by several factors. Technological and economic feasibility, the availability of suitable dam sites, environmental considerations and institutional matters will all play a role in determining the fate of SSH development in the coming years. Whether SSH projects are technologically and economically feasible are issues currently receiving a good deal of attention (NERBC Regional Report). Yet, unless other factors such as environmental impacts and institutional issues are assessed, the matter of SSH feasibility will have been only partially addressed. This paper looks briefly at one aspect of environmental planning for hydroelectric projects - land use impacts. The definition of land use employed here is broad. The term land encompasses areas which are not exclusively terrestrial in nature. It includes those areas at the land/water interface such as riverine floodplains and wetlands. The term use is also defined broadly to include natural as well as other uses of land such as development for recreation, agriculture, or various commercial activities. Given this definition, an overview is provided of some of the land use impacts to which SSH development might lead. Also, some institutional mechanisms through which these impacts might be addressed will be reviewed.

18239 **Gas bubble disease in smallmouth bass and northern squawfish from the Snake and Columbia Rivers.** Montgomery, J.C.; Becker, C.D. (Battelle Pacific Northwest Labs, Wash). *Transactions of the American Fisheries Society ;* **109**: No. 6, 734-736(Nov 1980).

Supersaturation of the Columbia and Snake River systems was caused by entrainment of air into water spilling over hydroelectric dams. Total gas saturations of 100% or more have occurred during the spring in each river system. External signs of gas bubble diseases were noted in adult Smallmouth bass and northern squawfish collected from the lower Snake and mid-Columbia rivers during 1975-76. Emboli occurred beneath membranes of the opercula body, and fins of 72% of the smallmouth bass and 84% of the northern squawfish. Hemorrhage was also noted on the caudal, anal, and pectoral fins of several fish.

14 SOLAR ENERGY

REFER ALSO TO CITATION(S) 18153

18240 **(EMD—81-10) Management problems impede success of DOE's solar-energy projects.** Staats, E.B. (General Accounting Office, Washington, DC (USA)). 22 Dec 1980. 78p. GPO.

Report to the Congress by the Comptroller General of the United States.

Problems being experienced by the DOE's solar energy research and development projects in meeting their cost, schedule, and scope objectives are discussed. The need for better controls over project selection and administration to help improve the performance of these projects is identified. Recommendations are presented which GAO has made to DOE which would contribute to the solar projects' success. Solar thermal and photovoltaic projects were reviewed; some information is presented on six ongoing projects: the Northwest Mississippi Junior College, the Mississippi County Community College, and the Natural Bridges National Monument in Utah (photovoltaic technology) and Shenandoah Total Energy Experiment, the Crosbyton Solar Power Project in Texas, and the Coolidge Deep Well Experiment in Arizona (solar thermal technology). (MCW)

18241 (SERI/CP—761-1077(Vol.1), pp 179-183) **SOLERAS solar energy water desalination project.** Luft, W.; Al-Nemer, M. (Solar Energy Research Inst., Golden, CO). Mar 1981. NTIS, PC A12/MF A01.

From Solar desalination workshop; Denver, CO, USA (23 Mar 1981).

The SOLERAS Solar Energy Water Desalination Project has been conceived in order to advance the technical and economic feasibility of large scale solar powered desalination of brackish and seawater. Because of differences between seawater and brackish water desalting, two distinct systems will be developed. To accomplish the objective of the SOLERAS solar energy water desalination project, a 3-phase activity is planned. The phases are as follows: preliminary system design and cost analysis; detailed pilot plant design and construction; and pilot plant operation and training of personnel.

18242 **(SERI/TP—644-1160) Solar energy education: where do we stand.** O'Connor, J.K. (Solar Energy Research Inst., Golden, CO (USA)). Mar 1981. Contract AC02-77CH00178. 8p. (CONF-810509—17). NTIS, PC A02/MF A01.

From Annual conference of the International Solar Energy Society; Philadelphia, PA, USA (26 May 1981).

The purpose of this paper is to examine in detail the contents of the Education Data Base by analyzing the current distributions of solar energy courses, programs, and curricula offered in our nation's post-secondary educational institutions. A summary of the data base indicates that 892 educational institutions in the United States offer 2308 solar-related courses and 367 programs. The interest in these programs is reflected in the fact that in 1979, 760 institutions offered 1740 solar-related courses and 243 programs. The conclusion is that our nation's post-secondary institutions are responding to student demand and interest in solar energy.

18243 **(SERI/TP—753-1155) Diffusion of solar innovations through television news programming.** Shoemaker, F.; Halacy, D.; O'Keefe, G.J.; Sendroy, C.G. (Solar Energy Research Inst., Golden, CO (USA)). Apr 1981. Contract AC02-77CH00178. 7p. (CONF-810509—18). NTIS, PC A02/MF A01.

From Annual conference of the International Solar Energy Society; Philadelphia, PA, USA (26 May 1981).

The rationale, methodology, finished product, and evaluation of a series of short, topical films of various solar applications are presented. They were produced for use on prime-television news programming.

18244 **Agriculture, biology-chemistry, engineering.** Franta, G.E.; Glenn, B.H. (eds.). Contract AC02-77CH00178. Rockville, MD; International Solar Energy Society (1980). 701p. (CONF-800604—P2). NTIS, PC A99/MF A01.

From American section of the International Solar Energy Society conference; Phoenix, AZ, USA (2 Jun 1980).

Separate entries were made in the data base for 130 of the 146 papers included. 16 papers were previously included in the data base. (WHK)

18245 **Twenty-five years later--an address prepared for delivery at the Solar Jubilee Dinner June 4, 1980, at Phoenix, Arizona.** Yellott, J.I. (Arizona State Univ., Tempe). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 3-7(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The world-wide scientific organization which is known today as the International Solar Energy Society had its beginning in Phoenix 25 years ago, less than a mile from the hall in which the Solar Jubilee Banquet will be held. The Arizona civic leaders who founded the predecessor organization named it The Association for Applied Solar Energy and, as a Christmas present to the entire world, they incorporated it on December 24, 1954. Its aims were three-fold: to gather, compile, and disseminate information relating to solar energy; to foster research and education in fields related to solar energy; and to encourage the expansion and development of the applications of solar energy. An objective of this address is to

show how the founders set out to accomplish these objectives and to let the hearers and readers of this address determine for themselves how effectively they have reached their goals.

1401 Resources And Availability

REFER ALSO TO CITATION(S) 18306

18246 **(SAND—80-2581C) Computer-driven solar tracking mount.** Pruett, H.D.; Evans, T.L. (Sandia National Labs., Albuquerque, NM (USA)). 1980. Contract AC04-76DP00789. 6p. (CONF-8005158—1). NTIS, PC A02/MF A01.

From AS/ISES annual meeting; Philadelphia, PA, USA (27 May 1980).

Measurement of direct-normal insolation requires a solar tracking mount whose tracking accuracy is a small fraction of the angular field of view of the pyrheliometer being used. A two-axis, computer-driven, solar-tracking mount which eliminates the manual-adjustment and cable wrap-up problems associated with tradiational single-axis trackers has been developed. The mechanical and electronic features of this mount are described, and the software used to initially position it and to track the sun routinely is discussed.

18247 **(SERI/TP—721-1137) Daily radiation model for use in the simulation of passive solar buildings.** Sillman, S.; Wortman, D. (Solar Energy Research Inst., Golden, CO (USA)). Apr 1981. Contract AC02-77CH00178. 7p. (CONF-810509—20). NTIS, PC A02/MF A01.

From Annual conference of the International Solar Energy Society; Philadelphia, PA, USA (26 May 1981).

A model is presented to characterize solar radiation with just three input parameters for each day. This compressed daily radiation data may be used in place of hourly data in simulations of passive solar buildings. This method is tested with the SUNCAT passive simulation. Global horizontal and direct normal radiation data are input using the compressed daily form instead of by hour. Simulation results are found to be comparable to results based on hourly radiation data.

18248 **(SOLAR/0005—81/36) National Solar Data Program performance results.** (Vitro Labs., Silver Spring, MD (USA)). 1980. Contract AC01-79CS30027. 106p. NTIS PC A06/MF A01.

Seven papers are included. Four were abstracted previously. Separate abstracts were prepared for three papers. (MHR)

18249 (SOLAR/0005—81/36, pp 26p, Paper 3) **Microclimate of solar collection installations.** Howard, B.D. (Automation Industries, Silver Spring, MD). 1980. NTIS PC A06/MF A01.

In National Solar Data Program performance results.

The National Solar Data Network (NSDN) collects data on real time performance of solar energy systems at over 100 locations in the United States. High quality meteorological instrumentation is employed to document the on site conditions of insolation, temperature and on some selected sites, wind parameters and relative humidity. Minicomputers acquire the data, which are then transmitted for processing by the Central Data Processing System (CDPS) in which are resident calibration and analytical software. Nineteen sites from the NSDN were selected which are distributed in four climatic regions. A comparison is made between these real time microclimate data and regional weather values which are available as reference design weather data from sources available to solar designers. This evidence suggests that on site insolation can be as much as 35% below the reference values during months with high variability of cloud cover and enhanced air mass exchange. For the most part, real time on site microclimate data values fall below the expected model-derived values.

18250 **(SOLAR/0010—81/03) March 1981 environmental data for sites in the National Solar Data network.** Roha, D.M. (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). Mar 1981. Contract AC01-79CS30027. 222p. NTIS, PC A10/MF A01.

Environmental data for numerous sites grouped into 12 zones are presented. The data include insolation, temperatures, wind speed and direction, and humidity for each day. Insolation data include total, diffuse, direct, maximum and extraterrestrial insolation. Temperature data include average, daytime, nighttime, maximum and minimum temperatures, and system cold-water inlet temperatures for sites with domestic hot water systems. Humidity data include day and night values and maximum and minimum values. Most data are taken every 5 min. Rapidly varying data are taken every 32 sec. A technical discussion of the instruments and measurements used is included. (LEW)

18251 **Improvements in the utilizability relationships.** Theilacker, J.C.; Klein, S.A. (Univ. of Wisconsin, Madison). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 271-275(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The assumptions associated with the monthly average utilizability correlation developed by Klein have been investigated. The availability of long-term (20 years) hourly weather data made it possible to separate the errors associated with each assumption used to develop the correlation. A new method for determining monthly-average utilizability was developed and an improved correlation for flat-plate solar collectors is presented.

1403 Economics

18252 **(P—500-81-009) Regulations for the California solar energy tax credit. These regulations apply to solar systems installed during 1981.** (California Energy Commission, Sacramento (USA)). Jan 1981. 15p. California Energy Commission, Sacramento, CA.

The text of California Administrative Code Title 20, Chapter 2, Subchapter 8, Article 1 (adopted December 17, 1980 and effective January 1, 1981) is given in which it is stated that the article establishes guidelines and criteria which specify solar energy systems and energy conservation measures applied in conjunction with solar energy systems which are eligible for state tax credits pursuant to the Revenue and Taxation Code. Application and scope; eligibility; building permits; and warranty requirements of the General Provision are given. Definitions are given. Water heating, space conditioning; production of electricity; wind systems; and process heat and solar mechanical energy systems are specified in detail. (MCW)

18253 **Escalating payment financing--a policy option for residential solar energy.** Bergeron, K.D. (Sandia Lab, Albuquerque, NM). *Energy Communications ;* **6**: No. 3, 183-193(1980).

The unwillingness or inability of the homeowner who is typical of the potential residential (retrofit) solar energy market to apply "rational" economic alternatives is a market imperfection which may represent a significant obstacle to penetration of the market. A simple program is proposed which would make the decision whether or not to install solar equipment insensitive to the perceived time value of money or the discount rate. With Escalating Payment Financing the system is paid for by a loan whose payments, after taxes and operating costs, escalate at the same rate as the price of the displaced fuel. Results are given in the form of simple formulas. 5 refs.

1404 Environmental, Legal, And Institutional Aspects

REFER ALSO TO CITATION(S) 18307, 18323, 18738, 19363, 19364

1405 Solar Energy Conversion

REFER ALSO TO CITATION(S) 18146, 18204, 18303, 18378, 18449, 18450, 18775, 18786, 18787, 18806, 19097

18254 **(CONF-810349—1) Applications of laser annealing and laser-induced diffusion to photovoltaic conversion.** Lowndes, D.H.; Young, R.T.; Wood, R.F. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 20p. NTIS, PC A02/MF A01.

From High efficiency concentrator and III-V compound contractors in depth review meeting; Raleigh, NC, USA (31 Mar 1981).

Over the past several years it has been demonstrated that a variety of techniques involving pulsed laser irradiation of both single crystal and polycrystalline silicon by pulsed lasers can result in the reproducible achievement of high efficiency silicon solar cells. Pulsed laser annealing (PLA) after an ion implantation (II) step results in melting (for a time of order 100 nsec) and essentially defect-free liquid phase epitaxial regrowth within $\sim$ 0.5 μm of the surface. Complete electrical activation of a number of dopant ions, at concentrations exceeding ordinary solubility limits, has been demonstrated and crystalline (polycrystalline) silicon solar cell efficiencies of 16.6% (12.5%) have been obtained. Other p-n junction and solar cell fabrication techniques have been demonstrated. Pulsed laser processing has also been demonstrated to have several other unique and beneficial advantages in polycrystalline silicon substrates. For example, grain boundaries do not exist during laser melting, while dopant diffusion is taking place; the short melt durations involved further limit dopant diffusion; precipitates present after conventional high temperature dopant diffusion can be removed; and, certain types of electrically active grain boundaries can be made inactive by pulsed laser irradiation. Finally, grain growth in fine-grained polycrystalline silicon films, via pulsed laser melting and recrystallization, has been demonstrated. Because little is known about the application of similar pulsed laser processing techniques to compound semiconductors, particularly in connection with the formation of shallow p-n junctions, research has been devoted to studies of pulsed laser processing of GaAs and compound semiconductor solar cell fabrication techniques that are compatible with the use of pulsed lasers. Progress is reported. (WHK)

18255 **(COO—2982-67) Conversion of wood residues to diesel fuel.** Kuester, J.L. (Arizona State Univ., Tempe (USA). Coll. of Engineering and Applied Sciences). 1981. Contract AS02-76CS40202. 19p. (CONF-810237—1). NTIS, PC A02/MF A01.

From 4. annual wood energy program and contractor review meeting; Washington, DC, USA (9 Feb 1981).

The basic approach is indirect liquefaction, i.e., thermal gasification followed by catalytic liquefaction. The indirect approach results in separation of the oxygen in the biomass feedstock, i.e., oxygenated compounds do not appear in the liquid hydrocarbon fuel product. The general conversion scheme is shown. The process is capable of accepting a wide variety of feedstocks. Potential products include medium quality gas, normal propanol, paraffinic fuel and/or high octane gasoline. A flow diagram of the continuous laboratory unit is shown. A fluidized bed pyrolysis system is used for gasification. Capacity is about 10 lbs/h of feedstock. The pyrolyzer can be fluidized with recycle pyrolysis gas, steam or recycle liquefaction system off gas or some combination thereof. Tars are removed in a wet scrubber. Unseparated pyrolysis gases are utilized as feed to a modified Fischer-Tropsch reactor. The liquid condensate from the reactor consists of a normal propanol-water phase and a paraffinic hydrocarbon phase. The reactor can be operated to optimize for either product. If a high octane gasoline is desired, the paraffinic fuel is passed through a conventional catalytic reformer. The normal propanol could be used as a fuel extender if blended with the hydrocarbon fuel products. Off gases from the downstream reactors are of high quality due to the accumulation of low molecular weight paraffins.

18256 **(DOE/ER/04263—4) Flash photoelectrochemical studies of transient electrode processes important in solar energy conversion. Progress report, May 1, 1980-April 30, 1981.** Perone, S.P. (Purdue Univ., Lafayette, IN (USA). Dept. of Chemistry). Dec 1980. Contract AS02-77ER04263. 22p. NTIS, PC A02/MF A01.

The program objectives related to pulsed laser irradiation of semiconductor/liquid junction photoelectrochemical cells were: (1) detect and characterize transient photoproducts due to electrode and/or solution photoelectrolysis at the interface; (2) obtain time-resolved photoelectrolysis data indicative of charge transfer rates; (3) obtain photoelectrochemical measurements related to electron-hole recombination rates subsequent to pulsed laser irradiation; (4) utilize complementary spectroscopic methods for characterizing transient photoprocesses at the semiconductor/electrolyte interface; (5) characterize the dynamics of super-sensitizer interactions with sensitizing dyes adsorbed at the interface; and (6) direct observation of surface state photoelectrolysis processes. Progress is reported. (WHK)

18257 **(DOE/ER/10369—T1) Photoelectrochemistry at iron oxide electrodes. Progress report.** Kennedy, J.H. (California Univ., Santa Barbara (USA). Dept. of Chemistry). 1980. Contract AT03-76ER10369. 2p. NTIS, PC A02/MF A01.

Research on doping iron oxide for the purpose of enhancing its photoelectrochemical properties is briefly described. (WHK)

18258 **(DOE/ET/23001—T6) Development of high-efficiency, low-cost $ZnSiAst_2$ solar cells. Final report, April 9, 1979-June 8, 1980.** Andrews, J.E. (Research Triangle Inst., Research Triangle Park, NC (USA)). 1980. Contract AC04-79ET23001. 42p. NTIS, PC A03/MF A01.

A research program with an ultimate goal of fabricating a $ZnSiAs_2$/Si-web cascade solar cell is described. Calculations indicate, given a suitable material quality, that 23% efficiencies may be possible and that the Si-web substrate and materials proposed for this cell offer the potential for meeting the cost goals of $300/peak KW/sub e/. Significant results achieved under this contract include the successful conversion of the original open tube vapor phase epitaxial growth system to an organometallic growth approach which in turn led to reduced carrier concentrations, and improved material quality. This represents the first known chalcopyrite to be deposited via the MO-CVD technique. Additionally, epitaxial growth was obtained on α-Al_2O_3 and Si substrates for the first time. $ZnSiAs_2$/Si structures have been fabricated in which carrier collection from both sides of the interface was observed using the electron beam induced current measurement technique. N-type impurity doping experiments have been initiated with the objective of synthesizing n-$ZnSiAs_2$ via substitutional doping. (WHK)

18259 **(DOE/JPL/955328—80/4) Establishment of a production-ready manufacturing process utilizing thin silicon substrates for solar cells. Final report. Motorola report No. 2364/4.** Pryor, R.A. (Motorola, Inc., Phoenix, AZ (USA). Semiconductor Group). Oct 1980. Contract NAS-7-100-955328. 217p. NTIS, PC A10/MF A01.

Three inch diameter Czochralski silicon substrates sliced directly to 5 mil, 8 mil, and 27 mil thicknesses with wire saw techniques were procured. Processing sequences incorporating either diffusion or ion implantation technologies were employed to produce n+p or n+pp+ solar cell structures. These cells were evaluated for performance, ease of fabrication, and cost effectiveness. It was determined that the use of 7 mil or even 4 mil wafers would provide near term cost reductions for solar cell manufacturers.

18260 **(DOE/SF/23045—4) Chemical vapor deposition of thin-film polycrystalline Si for low-cost solar cells. Final technical report, July 23, 1979-July 22, 1980.** Ruth, R.P.; Simpson, W.I.; Yang, J.J.J.; Moudy, L.A.; Manasevit, H.M. Johnson, R.E. (Rockwell International Corp., Anaheim, CA (USA). Microelectronics Research and Development Center). Sep 1980. Contract AC03-79ET23045. 189p. NTIS, PC A09/MF A01.

A one-year research program has been carried out for the purpose of developing thin-film polycrystalline Si solar cells on low-cost substrate materials, directed toward the goal of achieving photovoltaic conversion efficiencies greater than 10% (AM1) at a cost of $100 to $300/kW (electric). The polycrystalline Si films used for the cells were prepared by direct chemical vapor deposition (CVD) techniques, and the required junctions/barriers were formed both by doping during film growth and by subsequent thermal diffusion. The program was organized into six major technical tasks: (1) preparation of thin films of polycrystalline Si on low-cost substrates by CVD techniques, (2) investigation and application of suitable impurity doping techniques, (3) characterization of polycrystalline CVD Si films, (4) investigation and characterization of properties of individual grains and grain boundaries, (5) fabrication and characterization of barrier structures in polycrystalline Si films, and (6) fabrication and characterization of experimental solar cells in polycrystalline Si on low-cost substrates. The activities and in-

vestigations carried out during the year in these tasks are described in detail.

18261 **(HNEI—80-06) Giant leucaena (koa haole) energy tree farm.** Brewbaker, J.L. (ed.). (Hawaii Univ., Honolulu (USA). Hawaii Natural Energy Inst.). Sep 1980. 90p. Univ. of Hawaii, Manoa.

Giant leucaena is a tall arboreal form of the common koa haole of the tropics that is known for its wide adaptability, hardiness, and rapid growth. Wood yields of the giant leucaena equal or exceed those of other tropical trees and can be the equivalent annually of 30 barrels of oil per acre. In addition, the tree is a legume that produces a marketable co-product, a nutritious, high-nitrogen leaf meal. A thorough assessment is provided of the known yield capability of giant leucaena, its soil and fertilizer needs, its impact on the environment, its water and irrigation needs, its handling from nursery through establishment, its wood properties and combustion characteristics, and methods of harvesting suitable for the comparatively small trees to be grown. Analyses are also given of capital equipment and operating expenses, labor needs, effects of tax incentives, and economic considerations of application to various scenarios and market conditions in Hawaii. This study suggests that giant leucaena could be grown profitably in Molokai as a source of fuel wood and co-product animal feed.

18262 **(LBL—12207) Lignin biodegradation and the production of ethyl alcohol from cellulose.** Rosenberg, S.L.; Wilke, C.R. (Lawrence Berkeley Lab., CA (USA)). Feb 1981. Contract W-7405-ENG-48. 15p. (CONF-7805221—1). NTIS, PC A02/MF A01.

From Lignin biodegradation: microbiology, chemistry, and potential applications seminar; Madison, WI, USA (9 May 1978).

During the last few years our group has been engaged in developing a biochemical process for the conversion of lignocellulosic materials to ethyl alcohol. Lignin is a barrier to complete cellulose saccharification in this process, but chemical and physical delignification steps are too expensive to be used at the present time. An enzymatic delignification process might be attractive for several reasons: little energy would be expected to be needed, enzymes could be recovered and reused, and useful chemicals might be produced from dissolved lignin. A number of thermophilic and thermotolerant fungi were examined for the ability to rapidly degrade lignocellulose in order to find an organism whcih produced an active lignin-degrading enzyme system. Chryosporium pruinosum and Sporotrichum pulverulentum were found to be active lignocellulose degraders, and C. pruinosum was chosen for further study. Lignin and carbohydrate were degraded when the substrate remained moistened by, but not submerged in, the liquid medium. Attempts were made to demonstrate a cell-free lignin degrading system by both extraction and pressing of cultures grown on moist lignocellulose. Carbohydrate-degrading activity was found but not lignin-degrading activity. This led us to ask whether diffusible lignin-degrading activity could be demonstrated in this organism. The data indicate that the lignin degradation system, or one or more of its components, produced by this organism is either unstable, non-diffusible, or inactive at small distances (about 1 mm) from growing hyphae. At present, studies are being conducted using diffusion cultures to select mutants of C. pruinosum that do produce a diffusible lignin degradation system. We are also examining a number of mesophilic lignin-degrading molds for this ability.

18263 **(NCEI—0029) Rates of biomass accumulation of North Carolina Piedmont forests.** Peet, R.K.; Council, O.P. (North Carolina Univ., Chapel Hill (USA). Dept. of Botany). Jan 1980. 53p. NTIS, PC A04/MF A01.

Recent work by Sharp et al. on the primary production of North Carolina vegetation has suggested that the average natural forest in North Carolina is unproductive relative to its potential as intensively managed forest, the difference being roughly 300%. This variation could be attributable to patterns of forest recovery after disturbance, to management practices, or even to species composition. These and other alternative hypotheses need to be tested in a careful and objective manner. The primary objectives of the present research project were twofold: (1) to use dimension analysis methods to develop a set of regression equations useful for evaluating the productivity (rate of solar energy fixation) and biomass (stored energy) of North Carolina piedmont forests; (2) to use the resulting equations to document patterns in and rates of change of forest production and biomass during forest recovery from disturbance. The first objective was divided into two component parts. First, the regression equations were developed. Second, the caloric content of trees was studied so as to allow conversion from biomass units (Kg/m^2) to energy units ($Kcal/m^2$). Section 2 of this report outlines the dimension analysis procedure, presents the resulting equations, and explains their use. The portion of the project assessing the caloric content of trees is presented in Section 3. The results of our second objective, the examination of changes in forest biomass and production, are presented in Section 4.

18264 **(NYSERDA—81-3) Ethanol production in southwestern New York: technical and economic feasibility. Final report.** (Cornell Univ., Ithaca, NY (USA)). Jan 1981. 322p. New York State Energy Research and Development Authority, Albany.

Based upon the analysis conducted for this study, the development of centralized ethanol conversion facilities in the Steuben and Allegany Counties is likely to be commercially feasible if either locally produced cheese whey and/or imported corn are used as feedstocks. Development is shown to be profitable under a broad range of potential economic conditions and technical considerations. Four plant designs varying in annual production capacity from 1.675 to 27.5 million gallons of ethanol (and utilizing alternative conversion technologies and feedstocks) are investigated. In general, all of the various plant sizes investigated are economically viable. Although economic profitability is enhanced by the existence of federal subsidies, in the form of $0.40 per gallon from federal gasoline tax rebates, energy investment tax credits and low interest loans, a public subsidy is not necessary, under most conditions, to ensure the economic feasibility of any of the plant design investigated. In all cases, a by-product in the form of an animal feed is produced, thereby generating additional revenue for the conversion facility and adding to the likelihood of commercial feasibility. In the case of the corn/whey plant, the by-product takes the form of a distillers dried grain. In the case of the whey plants, it takes the form of a high mineral, medium protein feed supplement for low and moderate producing dairy cattle. Both have a ready market in the study region. Fermenting of deproteinized whey to produce ethanol and drying the resulting distillation slops for animal feed completely utilizes the original cheese whey. The techniques developed in this study produce three valuable products and leave no residual requiring disposal.

18265 **(P—500-80-051) Program negative declaration for the Biomass Conversion Demonstration Program.** (Envirosphere Co., New York (USA)). Sep 1980. 348p. California Energy Commission, Sacramento.

In accordance with the State Agricultural and Forestry Residue Utilization Act (SAFRUA), the California Energy Commission is implementing the Biomass Conversion Demonstration Program by offering supporting funding to selected energy projects that will convert agricultural and forestry residues to a usable energy form. The conversion processes include, but are not limited to, combustion, gasification, and methane fermentation. The purpose of this document is to describe the types of biomass projects that could be partially funded by the CEC pursuant to the SAFRUA, indicate the type of environmental setting into which such projects could be placed in the State of California, and provide supporting information for the conclusion that certain of these projects will not have any potentially significant environmental impacts. Significant environmental impacts could be associated with some biomass projects if they are of large size or are sited in sensitive areas. The impacts of these projects can only be properly addressed in project-specific environmental investigations. However, a large number of moderately sized biomass-fueled projects, if properly sited and in compliance with all applicable regulations, would not have any potentially significant environmental impacts. This latter group is addressed in this document.

18266 **(P—500-80-051(App)) Appendices for program negative declaration for the Biomass Conversion Demonstration Program.** (Envirosphere Co., New York (USA)). Sep 1980. 156p. California Energy Commission, Sacramento.

The purpose of this Study is to identify any potentially significant environmental impacts, to identify and document insignificant impacts, and to focus the scope of further environmental assessments for the Biomass Conversion Demonstration Program. A further purpose of this document is to provide organizations planning energy projects with technical information regarding the use of biomass as an energy resource. This Initial Study concludes that certain aspects of biomass projects individually and cumulatively could have potentially significant impacts on the environment. The nature of these potentially significant impacts is often very site specific and thus these impacts are difficult to address in the framework of a generic environmental assessment. If the scope of the generic environmental assessments of biomass projects is carefully developed to exclude those projects with certain types of site specific impacts, then it can be demonstrated that the biomass projects remaining in consideration will not have potentially significant impacts either individually or cumulatively. This document, which has been organized according to California Energy Commission guidelines, includes: a section describing the Biomass Conversion Demonstration Program; sections describing the environmental settings, and fuels associated with biomass projects; a section illustrating the environmental regulations applicable to biomass projects; and sections identifying the potential environmental impacts of each of three process types (combustion, gasification and methane fermentation) using a checklist approach. Appendices to the Study identify the individuals involved in the study effort and list the applicable bibliography.

18267 **(SAND—81-0286C) Composition of low-strength solder joints in solar-concentrator-cell arrays.** Chamberlain, M.B.; Nordstrom, T.V. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 11p. (CONF-810617—1). NTIS, PC A02/MF A01.

From 3. symposium on applied surface analysis; Dayton, OH, USA (3 Jun 1981).

Bond strengths of Cu strips soldered to the backside metallization of solar concentrator cells were found to be unacceptably low. To determine whether contaminants in the cell metallization caused these low strengths, unsoldered cells and soldered cells were characterized by scanning Auger microscopy. The backside metallization consisted of a 5 μm Ag conductor layer, a 150 nm Pd diffusion barrier and a 150 nm Ti adhesion layer next to an Al ohmic contact layer on the Si cell. The analysis showed that the Ti layer had been partially oxidized during soldering, that Pb from the Pb-5 wt % Sn - 2.5 wt % Ag solder segregated during soldering to the Pd-oxidized Ti interface, and that low strength fractures occurred in this Pb layer at the Pd-oxidized Ti interface. The problem was solved by changing the ambient gas used during soldering from N_2 to forming gas (80% N_2 + 20% H_2).

18268 **(SAND—81-7001) Commercialization of photovoltaic-concentrator systems. Final report, February 13, 1978-November 31, 1979.** Moeller, D.E. (Sun Trac Corp., Glenview, IL (USA)). Feb 1981. Contract AC04-76DP00789. 76p. NTIS, PC A05/MF A01.

Efforts to improve, fabricate, and test a prototype of a photovoltaic concentrator array that could meet production costs of $5/Wp for volumes of 500 kWp are described. The study deals with low-cost compound parabolic concentrators, low material-content structures, light matrix structures, and low-cost, two axis tracking. The prototype combines low-cost assembly with high-volume production of components. However, the design incorporates a transparent rigid spherical enclosure that inhibits cell cooling and limits optical efficiency, for an overall efficiency of about 5%; it is unlikely that an array of this design can meet the stated goals.

18269 (SERI/CP—622-1086, pp 65-78) **Utilization of mesquite (prosopis spp) pods for ethanol production.** Felker, P.; Clark, P.R.; Osborn, J.F.; Cannell, G.H. (Univ. of California, Riverside). 1980. NTIS, PC A11/MF A01.

From Tree crops for energy co-production on farms; Estes Park, CO, USA (12 Nov 1980).

Mesquite (Prosopis spp) is a nitrogen fixing, salt-tolerant, arid land shrub or tree which occurs on 72 million acres of semiarid marginal land in the southwestern United States. Clonal Prosopis selections have been made for pod and woody biomass characters after evaluation of 80 accessions representing 13 species in four field plantings. Experimental mesquite strains show promise as an energy crop both from production of woody biomass and from fermentation of 36% sugar content pods.

18270 (SERI/CP—622-1086, pp 209-217) **Utilization of mesquite and honey locust pods as feedstocks for energy production.** Avgerinos, G.C.; Wang, D.I.C. (Massachusetts Inst. of Tech., Cambridge). 1980. NTIS, PC A11/MF A01.

From Tree crops for energy co-production on farms; Estes Park, CO, USA (12 Nov 1980).

The direct fermentative production of ethanol from agricultural residues, such as corn stover, has previously been examined with a mixed culture of Clostridium thermocellum and Clostridium thermosaccharolyticum at MIT. Using this mixed culture concept, the carbohydrate rich pods from hybrid mesquite (Prosopis alba X Prosopis velutina) and honey locust (Gleditsia triacanthos) represent potentially useful substrates for liquid fuel production.

18271 **(SERI/PR—8136-1-T2) Development of high-efficiency cascade solar cells. Technical progress report no. 4.** (Solar Energy Research Inst., Golden, CO (USA)). Jan 1981. Contract AC02-77CH00178. 25p. NTIS, PC A02/MF A01.

The basic objective of this work is to develop the technology required to fabricate two-junction cascade solar cells having conversion efficiencies of 30 percent or more under multisun illumination. An intermediate objective is to demonstrate a cascade cell having 25 percent conversion efficiency. Experimental cascade cells have previously been demonstrated in two different III-V materials systems: AlGaAsSb/GaAsSb and AlGaAs/GaAs. Although both of these cells were grown by liquid phase epitaxy (LPE), organo-metallic chemical vapor deposition (OM-CVD) growth techniques are also being explored. Progress is reported. (WKH)

18272 **(SERI/PR—8142-4-T1) Preparation and characterization of hydrogenated amorphous silicon. Quarterly progress report No. 6, 1 September-30 November 1980.** Donovan, T.M. (Naval Weapons Center, China Lake, CA (USA). Michelson Labs.). 1980. Contract AC02-77CH00178. 11p. NTIS, PC A02/MF A01.

The objective of this work is to evaluate dc magnetron sputtering as a viable approach to producing amorphous SiH thin films for solar photovoltaic applications. It has been shown that the optical and transport properties of these films are similar to those of rf diode sputtered material, but the photoresponse and, more importantly, Schottky diode performance are inferior to that already obtained by rf diode sputtering. Attempts to improve the photoresponse and diode performance by doping with nitrogen have not been successful. It is speculated that this is due, in part, to a loose, island-type film morphology, which, in the case of glow discharge deposition, has been associated with poorer quality device material. In order to improve film morphology, ion bombardment was added to the deposition process. Transmission electron microscopy and SIMS measurements are discussed. Optical properties, transport, and photoconductivity of oxygen-doped rf diode films are discussed. (WHK)

18273 **(SERI/PR—9062-1-T5) Zn_3P_2 as an improved semiconductor for photovoltaic solar cells. Ninth quarterly report, September 1, 1980-November 31, 1980.** (Delaware Univ., Newark (USA). Inst. of Energy Conversion). 1980. Contract AC02-76CH00178. 57p. NTIS, PC A04/MF A01.

Frequency and voltage dependent capacitance measurements of ZnO/Zn_3P_2 heterojunctions have been made and the results interpreted according to a model which considers the total capacitance arising from contributions due to the depletion layer capacitance, interface charges and a dipole charge. The capacitance of the devices is anomalously high at low frequencies but agrees well with the value calculated from the bulk carrier density at 1 MHz. The data suggest a significant contribution to the capacitance from the charging and discharging of interface states. Direct evidence for a relationship between defects in the Zn_3P_2 (grains boundaries, dislocations, etc.,) and the collected current have been found by comparing EBIC images of ZnO/Zn_3P_2 devices with the etched surfaces of the samples. The series resistance of thin film Zn_3P_2 devices has been analyzed and the origin of the series resistance con-

sidered. A new substrate consisting of sequentially deposited layers of Fe and Si on mica has resulted in improved device performance. Devices with a conversion efficiency as high as 2.7% have been obtained. Fill factors in excess of 50% have been obtained for the first time. The diffusion coefficient of magnesium has been measured to 100°C and 125°C using a spectral response method. A model including contributions from both diffusion and space charge recombination terms was utilized to calculate the open circuit voltage and short circuit current as a function of junction depth of the n on p devices. A comparison of the experimental J/sub sc/ and V/sub oc/ as a function of junction depth was made by characterizing the devices after successive surface diffusions. Results are presented and disucssed. (WHK)

18274 (SERI/PR—9077-1-T2) Thin-film polycrystalline silicon solar cells. Quarterly report no. 3, October 16, 1980-January 15, 1981. Ghosh, A.K.; Feng, T.; Eustace, D.J.; Maruska, H.P. (Exxon Research and Engineering Co., Linden, NJ (USA). Advanced Energy Systems Labs.). 1981. Contract AC02-77CH00178. 46p. NTIS, PC A03/MF A01.

The objectives of the project are: 1) to develop cell fabrication procedures to further define the maximum capabilities of the conducting oxide/silicon heterojunction solar cells; 2) to optimize the spray fabrication technique for making reproducible high efficiency cells; 3) to assess the stability and the projected lifetime of the cell structure; 4) to identify through appropriate measurements the effects of grain boundaries and intragrain defects on the electronic transport mechanisms in thin-film polycrystalline silicon; and 5) to determine the feasibility of a large-scale fabrication process. Progress is reported.

18275 (SERI/PR—9080-1-T3) MIS solar cells on thin polycrystalline silicon. Progress report No. 3, September 1-November 30, 1980. Anderson, W.A. (State Univ. of New York, Buffalo (USA). Dept. of Electrical Engineering). Dec 1980. Contract AC02-77CH00178. 84p. NTIS, PC A05/MF A01.

The first task of this project involves electron-beam deposition of thin silicon films on low cost substrates. The goal is to obtain 20 μm thick films having 20 μm diameter crystallites which may be recrystallized to $>$ 40 μm. Material characterization and device studies are to be included in efforts to reach a 6% conversion efficiency. The second task deals with MIS solar cell fabrication on various types of silicon including poly-Si, ribbon-Si, silicon on ceramic, and thin film silicon. Conduction mechanism studies, optimum engineering design, and modification of the fabrication process are to be used to achieve 13% efficiency on Xtal-Si and 11% efficiency on poly-Si. The third task involves more detailed test procedures and includes spectral response, interface and grain boundary effects, computer analysis, materials studies, and grain boundary passivation. Progress is detailed. (WHK)

18276 (SERI/TP—622-1139) Biomass thermal conversion research at SERI. Milne, T.A.; Desrosiers, R.E.; Reed, T.B. (Solar Energy Research Inst., Golden, CO (USA)). Sep 1980. Contract AC02-77CH00178. 39p. (CONF-800973—3). NTIS, PC A03/MF A01.

From 11. biomass thermochemical conversion contractors meeting; Richland, WA, USA (23 Sep 1980).

SERI's involvement in the thermochemical conversion of biomass to fuels and chemicals is reviewed. The scope and activities of the Biomass Thermal Conversion and Exploratory Branch are reviewed. The current status and future plans for three tasks are presented: (1) Pyrolysis Mechanisms; (2) High Pressure O_2 Gasifier; and (3) Gasification Test Facility.

18277 (SERI/TP—623-1073) Photoconversion of organic substrates into hydrogen using photosynthetic bacteria. Weaver, P.F. (Solar Energy Research Inst., Golden, CO (USA)). Mar 1981. Contract AC02-77CH00178. 12p. (CONF-810116—3). NTIS, PC A02/MF A01.

From 5. annual IGT meeting on energy from biomass and wastes; Lake Buena Vista, FL, USA (26 Jan 1981).

Under nitrogen-limited conditions, photosynthetic bacteria photoconvert a wide variety of organic substrates nearly totally into H_2 and CO_2. More than 98% of the chemical energy of defined organic compounds even from dilute solutions can be recovered as combustible energy of the H_2 produced. Not calculating the chemical energy input, radiant (solar) energy recoveries are approximately 5% over a wide range of incident light intensities. Batch cultures can photoproduce H_2 at rates of 175 ml per gram dry weight of cells per hour (equal to a volume of H_2 per equivalent volume of liquid medium every 4 to 6 hours) when incubated in saturating light. With periodic refeeding, rates remain constant for several weeks. In closed containers H_2 pressures of 735 psig can be generated. In principle, this pressure can be used to decrease storage volume of the gas, to move it through pipelines or to provide required process pressures. Alcohol stillage and food processing wastes are excellent photoconvertible substances. When non-photosynthetic bacteria synthesizing appropriate polysaccharases are included in co-culture with photosynthetic bacteria, cellulose and other polysaccharides can be converted to H_2 and CO_2, albeit at low rates. Prospects for enhancing the photoconversion reactions of photosynthetic bacteria by environmental and genetic manipulations are discussed.

18278 (SERI/TR—621-754) Biotechnology for producing fuels and chemicals from biomass. Volume II. Fermentation chemicals from biomass. Villet, R. (ed.). (Solar Energy Research Inst., Golden, CO (USA)). Feb 1981. Contract AC02-77CH00178. 58p. NTIS, PC A04/MF A01.

The technological and economic feasibility of producing some selected chemicals by fermentation is discussed: acetone, butanol, acetic acid, citric acid, 2,3-butanediol, and propionic acid. The demand for acetone and butanol has grown considerably. They have not been produced fermentatively for three decades, but instead by the oxo and aldol processes. Improved cost of fermentative production will hinge on improving yields and using cellulosic feedstocks. The market for acetic acid is likely to grow 5% to 7%/yr. A potential process for production is the fermentation of hydrolyzed cellulosic material to ethanol followed by chemical conversion to acetic acid. For about 50 years fermentation has been the chief process for citric acid production. The feedstock cost is 15% to 20% of the overall cost of production. The anticipated 5%/yr growth in demand for citric acid could be enhanced by using it to displace phosphates in detergent manufacture. A number of useful chemicals can be derived from 2,3-butanediol, which has not been produced commercially on a large scale. R and D are needed to establish a viable commercial process. The commercial fermentative production of propionic acid has not yet been developed. Recovery and purification of the product require considerable improvement. Other chemicals such as lactic acid, isopropanol, maleic anhydride, fumarate, and glycerol merit evaluation for commercial fermentative production in the near future.

18279 (SERI/TR—8277-1-T2) Thin-film polycrystalline silicon solar cells. Final technical report, 1 October 1979-30 September 1980. Sarma, K.R.; Rice, M.J.; Legge, R.; Ellis, R.J. (Motorola, Inc., Phoenix, AZ (USA)). Nov 1980. Contract AC02-77CH00178. 81p. NTIS, PC A05/MF A01.

The objectives of this research program were: (1) investigation of a semicontinuous plasma deposition system as a means for efficient, high rate deposition of polycrystalline silicon films; (2) development of low-cost reuseable substrates for deposition and shear separation of the silicon films; (3) optimization of subsequent grain enhancement of the films through RTR laser recrystallization; and (4) demonstration of at least 12% efficient, large area (greater than 10 cm^2) solar cells fabricated on grain enhanced silicon films. Significant progress was made on all the tasks, and details are presented. Reuseable substrate system studies include characterization of the molybdenum temporary substrates as they are recycled through silicon film deposition-separation cycles, and establishment of the shear separation mechanism. High pressure plasma (HPP) deposition of microcrystalline silicon films is described. The deposition process was characterized by on-line gas chromatographic analysis of the reactor effluent gases under various conditions of substrate temperature, reactant flow rates, and concentrations using the chlorosilanes $SiCl_4$, $SiHCl_3$ and SiH_2Cl_2. A detailed characterization of grain-enhanced silicon films is given. The solar cell fabrication and evaluation effort is described in detail. (WHK)

18280 (SERI/TR—98372-1) Anaerobic fermentation of beef cattle manure. Final report. Hashimoto, A.G.; Chen, Y.R.; Varel, V.H. (Department of Agriculture, Clay Center, NE (USA). Meat Animal Research Center). Jan 1981. Contract AC02-77CH00178. 76p. NTIS, PC A05/MF A01.

The research to convert livestock manure and crop residues into methane and a high protein feed ingredient by thermophilic anaerobic fermentation are summarized. The major biological and operational factors involved in methanogenesis were discussed, and a kinetic model that describes the fermentation process was presented. Substrate biodegradability, fermentation temperature, and influent substrate concentration were shown to have significant effects on CH_4 production rate. The kinetic model predicted methane production rates of existing pilot and full-scale fermentation systems to within 15%. The highest methane production rate achieved by the fermenter was 4.7 L CH_4/L fermenter day. This is the highest rate reported in the literature and about 4 times higher than other pilot or full-scale systems fermenting livestock manures. Assessment of the energy requirements for anaerobic fermentation systems showed that the major energy requirement for a thermophilic system was for maintaining the fermenter temperature. The next major energy consumption was due to the mixing of the influent slurry and fermenter liquor. An approach to optimizing anaerobic fermenter designs by selecting design criteria that maximize the net energy production per unit cost was presented. Based on the results, we believe that the economics of anaerobic fermentation is sufficiently favorable for farm-scale demonstration of this technology.

18281 (UCRL—52000-81-4, pp 11-21) **Modeling of solid-state materials for solar cells.** Apr 1981. NTIS, PC A03/MF A01.

In Energy and technology review.

One promising method of converting solar energy into electricity is with solar cells. However, the cost per watt of electrical energy delivered is quite high compared with that associated with more conventional ways of generating electricity. New potential solar cell materials are being developed that might make photovoltaic conversion more competitive by decreasing the cost per cell or by increasing a cell's efficiency, but evaluating each material experimentally (without theoretical assistance) would be a monumental task. To facilitate the evaluation of emerging materials, we have developed, under the auspices of the Solar Energy Research Institute, a computer model that can predict their optical and transport properties and evaluate the performance of solar cells made from them. The model enables one to evaluate potential solar-cell materials quickly at a modest cost.

18282 Microbial conversion of biomass to methane. Chynoweth, D.P. Chicago, IL; Institute of Gas Technology (1981). 27p. (CONF-810315—10).

From 8. energy technology conference and exposition; Washington, DC, USA (9 Mar 1981).

Laboratory studies have investigated the anaerobic digestion of a variety of feedstocks including sea kelp, water hyacinth, terrestrial herbaceous and woody plants, sewage sludge, municipal solid waste, and biomass-organic waste blends. The results of these and other studies are used to illustrate key factors which influence methane production rates and yields, including feed organic composition, nutrients, inoculum, temperature, retention time, feed concentration, particle size, and mixing. A new process recently developed which combines biological and thermal operations for conversion of biomass to substitute natural gas is described.

18283 Nondestructive SEM measurement of minority-carrier transport parameters of Cu/sub x/S/Cds solar cells as a function of heat treatment. Partain, L.D.; Armantrout, G.A.; Okubo, D. (Lawrence Livermore Lab, Calif). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Electron Devices ;* **ED-27**: No. 11, 2127-2133(Nov 1980).

Electron-beam-induced-current techniques of a scanning-electron microscope have been extended to allow nondestructive measurements to be performed on p-n heterojunction devices consisting of thin layers sensitively influenced by surface effects and under conditions where junction collection efficiency is less than perfect. When applied to Cu/sub x/S/CdS solar cells formed on polycrystalline CdS with an epitaxial Cu/sub x/S layer that was heat treated at 180°C in a hydrogen-argon ambient, the dominant change was found to be the greater than two increases in junction collection efficiencies to a maximum and then a decrease for treatment times up to 120 min. 33 refs.

18284 Tunneling currents in the copper sulfide/cadmium sulfide heterojunction. Haines, W.G.; Bube, R.H. (Stanford Univ, Calif). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Electron Devices ;* **ED-27**: No. 11, 2133-2140(Nov 1980).

The parameters controlling the photovoltaic properties of the Cu_2 S/CdS heterojunction have been investigated. It is found that the behavior of the short-circuit current and the open-circuit voltage are describable in terms of a deep, donor-like level in the CdS region adjacent to the metallurgical interface. 20 refs.

18285 Biomass options for the big island of hawaii. Meagher, P.C.; Kinderman, E. (Stanford Research Inst. International, Calif). pp 92-98 of Proceedings--region 6 conference, the 1980's--a forest of energy decision trees. Piscataway, NJ; IEEE (1980).

From IEEE Region 6 conference; San Diego, CA, USA (20 Feb 1980).

In a study sponsored by the DOE, SRI International has evaluated a variety of alternatives including conservation efforts and the use of the Hawaii's renewable energy resources. Of the options available, the savings achievable through use of fuel-efficient vehicles and utilization of biomass-conversion technologies to augment supply appear to have the greatest potential for helping the Island achieve greater energy self-sufficiency.

18286 Biomass from marine macroscopic plants. North, W.J. (Calif Inst of Technol, Pasadena). *Solar Energy ;* **25**: No. 5, 387-395(1980).

Marine biomass production is attractive as a source of fuel when seaweeds are reduced to gaseous fuel by way of bacterial digestion. Investigations of Woods Hole Oceanographic Institution have involved screening species to identify the highest producers, factors influencing productivity, and special studies such as efficiency with which nitrogen can be recycled within the culturing system. Investigations at the California Institute of Technology have emphasized culturing a single large species, the giant kelp. Efforts were made to identify the principal problems involved in growing plants in oceanic settings. Economic studies by three organizations have dealt primarily with the feasibility of oceanic as opposed to coastal farming systems. 22 refs.

18287 Biomass: a global view. Bente, P.F. Jr. (Bio-Energy Council, Washington, DC). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 76-79(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Highlights of bio-energy development programs and usage are presented for selected countries to gain an insight into the role of sunfuels in the global energy picture. The alternative of using corn as feed or as an alcohol fuel/feed combination is considered, indicating that there is not likely to be any difference in cost of food or use of farmland when alcohol is made from part of the corn.

18288 Some thoughts on the efficiency of the conversion of light to work. Bolton, J.R. (Univ. of Western Ontario, London); Archer, M.D. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 81-83(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The thermodynamic limit on the conversion of light to work is ~ 0.93 for direct and ~ 0.70 for diffuse sunlight. However, the purely thermodynamic approach to the problem does not take into account inherent losses in the transducer. When these losses are taken into account, a detailed balance limit is obtained in which the efficiency drops to ~ 0.29 for AM O and ~ 0.32 for AM 1.2 solar radiation. One of the additional loss factors is the thermal equilibration of the electronically excited state in quantum conversion devices. The main consequence of the detailed balance treatment is

that the excited state loses all memory of the nature of the incident radiation and the only factor which will affect the conversion efficiency is the flux of incident photons capable of creating excited state molecules. Hence, two light sources, one direct and the other diffuse, will have the same limiting efficiency of work generation if the rate of production of excited states is the same.

18289 **Organic solar cell: chlorophyll monolayer assemblies on semiconductor films.** Janzen, A.F. (Photochemical Research Associated Inc., London, Ontario, Canada). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 88-89(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

18290 **Feasibility of using Salsola Kali L. (Russian thistle) as a source of biofuels.** Karpiscak, M.M.; Rawles, R.L.; Foster, K.E. (Univ. of Arizona, Tucson). Contract FG03-79SF10550. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 90-93(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A geographical area of the United States not usually considered for biofuel production is the arid Southwest. The Southwest has abundant sunshine, but water is scarce, which precludes the growth of many high water-using crops. One possible plant to be cultivated in the Southwest for biofuels is Salsola kali L., more commonly known as Russian thistle or tumbleweed. Salsola produces a large biomass quickly with minimal cultivation and fertilizer insecticide and water applications. The cost of producing Salsola biomass is low and it is amenable to harvesting by conventional farming machinery. In Arizona alone up to 240,000 ha re expected to be withdrawn from conventional agriculture by the year 2020 as pumping costs increase, water supplies dwindle and water-supply priority is given to municipal and industrial uses. In the case of Russian thistle there is also an opportunity to stimulate the agricultural economies of aridland communities that have suffered revenue losses due to limited availability and high cost of water.

18291 **Energy plantations: a future source of biomass.** Frederick, D.J.; Williford, M. (North Carolina State Univ., Raleigh). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 104-109(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Woody biomass can furnish a significant portion of alternative energy sources in the future. Mill and logging residues and biomass derived from existing forests will supply most of this wood energy in the next decade. Energy plantations have good potential for providing a dependable and sustained supply of woody biomass in the long term. The U.S. Department of Energy is supporting a substantial research effort to develop fuels and chemical foodstocks from woody biomass. Seventeen projects are currently active and encompass four major research areas: species selection; stand establishment; cultural treatments and management alternatives;, and harvest, collection, transport, and storage. Research at N.C. State University shows loblolly pine, numerous indigeneous hardwoods, and the exotics: European black alder and numerous Eucalyptus species to have good potential for energy plantation culture on selected sites. Major consideration in evaluating energy plantations are land availability, site impacts, and competion for alternative land uses.

18292 **Hydrocarbon production from arid land plant species.** Hinman, C.W. (Diamond Shamrock Corp., Tucson, AZ); Hoffmann, J.P.; McLaughlin, S.P.; Peoples, T.R. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 110-114(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Suggestions that certain plant species could serve as alternative sources of liquid hydrocarbons have led to an indepth evaluation of their potential. Investigations of Euphorbia lathyris in terms of its chemical composition, hydrocarbon yield, biomass yield and cultivation parameters are described in this presentation.

18293 **Light energy conversion by halobacteria.** Packer, L. (Univ. of California, Berkeley). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 118-121(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Bacteriorhodopsin in the purple membrane of halobacteria is the simplest and most stable biological light energy converter presently known. Much of our current research on bacteriorhodopsin is concerned with the molecular details of how this protein can develop a proton current and generate electrical charges at its surface after light is absorbed by its chromophore. The understanding of proton conduction across proteins is of primary importance in the understanding of most energy converting biomembranes. Evidence is also mounting that there may be another photocatalyst in halobacteria that can pump sodium directly without the obligatory participation of protons. The electrical potentials generated by these two photocatalysts is of obvious importance for potential photocell applications. In addition, sodium currents can provide considerably more electrical power than protons (since the latter eventually give rise to pH changes) and could be useful for desalination studies.

18294 **Comprehensive pyrolytic process for conversion of wood to sugar derivatives and fuels.** Shafizadeh, F. (Univ. of Montana, Missoula). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 122-125(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A process has been developed for stepwise conversion of wood and biomass to a combination of chemicals and fuel derived from the hemicelluloses, cellulose and lignin components. This process is based on a combination of prehydrolysis with controlled pyrolysis of the remaining lignocellulosic components.

18295 **Low temperature thermoconversion of biomass to organic chemicals in the presence of aluminum chloride.** Koch, V.R.; Schnaper, G.H. (EIC Corp., Newton, MA). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 126-129(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The uncertain availability and increasing cost of crude oil make domestic biomass an attractive source of organic chemicals. Accordingly, the low temperature thermoconversion of rice hulls, an agricultural residue, was accomplished at 175°C in the presence of $AlCl_3$ vapor. Among the volatile products were acetone, methylisobutyl ketone, and a reactive oil which formed solid carbohydrate-like products when warmed to room temperature. The source of these compounds was found to be the hemicellulose portion of of the rice hulls. Lignin and cellulose failed to produce volatile products at 175°C.

18296 **Radiant flash pyrolysis of biomass as a source of fuels and chemicals.** Antal, M.J. Jr.; Hofman, L.; Moreira, J.R. (Princeton Univ., NJ). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 130-134(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Last year a team of US and French scientists using the Odeillo (France) 1MW/sub th/ solar furnace showed concentrated solar radiation to be an effective means for rapidly volatilizing biomass materials. The results of continuing research in the U.S. on radiant flash pyrolysis of biomass as a source of fluid fuels, industrial feedstocks and chemicals are described. Bench scale sources of intense, visible radiant energy have been used to simulate the concentrated solar flux available at the focus of solar towers. Windowed transport reactors are being developed, which act as cavity receivers for the focused radiant energy and provide a means for direct use of the radiation to rapidly pyrolyze the entering biomass. One of these reactors will be operated at the focus of the Georgia Tech 400kW/sub th/ solar furnace next August. Preliminary results from the bench scale reactor experiments, and plans for the Georgia Tech experiments are detailed.

18297 Acid-base model for thermochemical water splitting: results of experimental tests on manganese-based thermochemical cycles. Robinson, P.R. (Oak Ridge National Lab., TN); Kilyk, J. Jr. Contract W-7405-ENG-26. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 135-138(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A previously described acid-base model for thermochemical water splitting cycles is applied to cycles based upon reactions of manganese oxides. Experiments confirmed that at least 12 acids - HCl, H_2SO_4, H_3PO_4, MoO_3, $NaPO_3$, $Na_4P_2O_7$, SiO_2, Cr_2O_3, TiO_2, Al_2O_3, SnO_2, and Fe_2O_3 - drive the thermal decomposition of $NaMnO_2$ at temperatures below 1400 K. Only rather strong bases - NaOH, LiOH, BaO, Li_2CO_3, Na_2CO_3, $NaCO_3$ - can drive the steam oxidation of Mn(II) below 1300 K. In accord with the model, the acids HCl, H_2SO_4, H_3PO_4, and MoO_3 are too strong to be used in Mn(III)/(II) cycles, because their Na, Li, and Ba salts are too stable. Cycles were demonstrated with the other 8 acids and either NaOH or Na_2CO_3. Because such cycles evolve $O_2(g)$ in the presence of air, solar furnaces are appropriate sources of thermal energy for them.

18298 Lignin biodegradation: microbiology, chemistry, and potential applications. Kirk, T.K.; Higuchi, T.; Chang, H. (eds.). Boca Raton, FL; CRC Press, Inc. (1980). 269p. (CONF-7805221—(Vol.2)).

From Lignin biodegradation: microbiology, chemistry, and potential applications seminar; Madison, WI, USA (9 May 1978).

This volume contains the proceedings of an international seminar on lignin biodegradation. Comprehensive coverage of research to date on the microbiology, chemistry, and potential applications of lignin hydrolysis is provided. Separate abstracts have been prepared of all items for inclusion in the Energy Data Base. (DMC)

18299 Lignin biodegradation: microbiology, chemistry, and potential applications. Kirk, T.K.; Higuchi, T.; Chang, H.M. (eds.). Boca Raton, FL; CRC Press, Inc. (1980). 255p. (CONF-7805221—(Vol.1)).

From Lignin biodegradation: microbiology, chemistry, and potential applications seminar; Madison, WI, USA (9 May 1978).

An international seminar on lignin biodegradation was held May 9 to 11, 1978, at the US Forest Products Laboratory in Madison, Wisconsin. This book records the proceedings of that seminar and is meant to provide a state-of-the-art summary of research. Each speaker/author was asked to summarize his research, including his latest unpublished results, and to describe how his work fits into the overall picture. Following two orientation chapters, one a review of lignin structure and morphological distribution in plant cell walls, and the second a review of the microbial catabolism of relevant aromatics, the book is comprised of chapters in the three subject areas given by the book's title. It does, as intended, provide comprehensive coverage of research to date. Separate abstracts have been prepared of each item for inclusion in the Energy Data Base.

18300 Biothermal gasification of biomass and organic residues. Chynoweth, D.D.; Srivastava, V.J.; Jerger, D.E.; Tarman, P.B. Chicago, IL; Institute of Gas Technology (1980). 41p. (CONF-801104—14).

From 73. annual meeting of the American Institute of Chemical Engineers; Chicago, IL, USA (12 Nov 1980).

The BIOTHERMGAS process is described for gasification of biomass and organic residues to substitute natural gas (SNG). This process combines biological and thermochemical unit operations for the conversion of a broad variety of organic feeds such as plant materials, organic residues, and peat to SNG or other fuels, regardless of their water and nutrient content. The process employs biological gasification followed by thermochemical gasification of refractory digester residues. Ammonia and other inorganic nutrients are recycled from the thermochemical process unit to the biological gasification unit (digester). Waste heat from thermochemical conversion components is used to supply the heat requirement of the bioconversion component. The product gases from the thermochemical unit can be upgraded to SNG by either biological or catalytic methanation. The results of preliminary systems analyses of three different operating conditions are presented here: 9.1×10^6 kg/day Bermuda grass plant with catalytic methanation, 9.1×10^6 kg/day Bermuda grass plant with biomethanation, and 0.9×10^6 kg/day municipal solid waste (MSW) and sewage sludge plant with biomethanation. The results of these analyses indicate that the performance of this process is superior to biological or thermochemical processes used separately. Laboratory studies conducted on conversion of typical thermochemical product gases (H_2, CO_2, and CO) to methane in a sewage sludge digester showed that effective conversion of gases can be accomplished by biomethanation without any adverse effect on the sludge bioconversion process.

18301 Experimental cultivation of giant kelp in oceanic environments. North, W.J. (Calif Inst of Technol, San Diego). *American Society of Mechanical Engineers, [Paper] ;* No. 79-Sol-30, vp(12 Mar 1979).

The primary objective of the Marine Biomass Project is to develop an integrated system for producing, harvesting, and processing marine biomass, followed by conversion to methane. Giant Kelp, Macrocystis, is under current study as the producer of biomass, but other seaweed species may eventually be used. This paper describes primarily the kelp production studies. Objectives of the kelp production studies include: (a) determine elements needed in Macrocystis nutrition, (b) develop an optimal strategy for fertilizing plants in an oceanic setting, (c) determine harvest yields from a group of adult test plants continually fertilized. The most promising common source of plant nutrients in the sea lies in waters at depths of 100 m or greater. These could be pumped up by environmental energy to fertilize kelp held near the surface on artificial structures. 9 refs.

18302 Prospects for farming the open ocean. Wilcox, H.A. (Nav Ocean Syst Cent, San Diego, Calif). *American Society of Mechanical Engineers, [Paper] ;* No. 79-Sol-32, vp(12 Mar 1979).

Visualized prospects for farming the open oceans of the Earth are now based mainly on results obtained by the Navy's Ocean Food and Energy Farm Project. This Project was sponsored by several Federal agencies and private industry, and its results indicated that a system of giant oceanic farms would be capable of producing foods, liquid and gaseous fuels, lubricants, fertilizers, industrial chemicals, and plastics at rates sufficient to supply all the related requirements of one average U.S. citizen for each 2 to 3 acres of cultivated ocean. Synthetic natural gas from the system was projected to cost from about $2 up to about $7 per million Btu, depending mainly on credit values assumed for foods and other products (all dollar values expressed in constant 1974 dollars). The Project is proceeding under management of the General Electric Co. with financial sponsorship being furnished by the American Gas Industry and the U.S. Department of Energy. 48 refs.

1406 Photovoltaic Power Systems

REFER ALSO TO CITATION(S) 18259, 18335

18303 (DOE/ER—0097) Survey and documentation of emerging technologies for the satellite power system (SPS). Glaser, P.; Chapman, P. (Argonne National Lab., IL (USA)). Apr 1981. Contract W-31-109-ENG-38. 133p. NTIS, PC A07/MF A01.

The purpose of this study is to survey emerging technologies and new concepts which may offer advantages over those selected for the SPS Reference System. A brief historical overview of the genesis of the Solar Power Satellite (SPS) concept is presented leading to a discussion of the assumptions and guidelines which were originally established and which led to development of the SPS Reference System design concept. Some of these guidelines are applicable to almost any SPS design, but others could be changed, leading to new and perhaps preferable systems. Moreover, while some of the guidelines are based on solid data, some are little more than arbitrary assumptions which were adopted only to proceed with a concrete point design which then could be assessed in the DOE/NASA Concept Development and Evaluation Program. In order to stimulate new SPS concepts and to facilitate comparative assessment of emerging SPS technologies, one useful approach

is to break the overall system into functional parts. The system functions which must be performed by any SPS concept and the interrelations between them are discussed and a systematic framework is presented for assessment of the wide variety of system concepts and subsystem technologies which have been proposed. About 80 alternative SPS technologies are reviewed.

18304 **(DOE/ET/20279—127) Analysis and test of line-commutated inverters for use in residential photovoltaic power systems.** Landsman, E.E. (Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.). 1981. Contract AC02-76ET20279. 9p. (CONF-810526—2). NTIS, PC A02/MF A01.

From 15. IEEE PV specialists conference; Orlando, FL, USA (11 May 1981).

The line-commutated inverter is currently being used in a number of utility-interactive photovoltaic power systems because it is commercially available and attractively priced. The line-commutated inverter is a phase-controlled rectifier operating in the regenerative mode. Existing analyses emphasize rectifier mode of operation and there has been minimal treatment of the regenerative mode. A detailed theoretical analysis coupled with observation of operating inverters is leading to a better understanding of inverter operation which may lead to improvement in power factor and a reduction of harmonic currents. The normalized results of the theoretical analysis, test data, and waveforms are presented.

18305 **(SAND—80-2567) Analytical models for solar-photovoltaic energy-system components.** Edenburn, M.W. (Sandia National Labs., Albuquerque, NM (USA)). Apr 1981. Contract AC04-76DP00789. 147p. NTIS, PC A07/MF A01.

Analytical models for components used in solar photovoltaic energy systems have been incorporated into subroutines that are part of the solar energy system analysis computer program SOLSYS. Array thermal models calculate cell temperature and illumination for flat, point focus, and line focus arrays. Electrical subsystem models compute array power output (based on array current-voltage characteristics), battery parameters, and power conditioning equipment efficiencies. Cooling towers are modeled to determine coolant temperature for actively cooled arrays. A solar and weather data subroutine reads typical meteorological-year tapes and computes solar azimuth and elevation angles.

18306 **(SAND—80-7189) Simplified design guide for estimating photovoltaic flat array and system performance.** Evans, D.L.; Facinelli, W.A.; Koehler, L.P. (Arizona State Univ., Tempe (USA). Dept. of Mechanical and Energy Systems Engineering). Mar 1981. Contract AC04-76DP00789. 169p. NTIS, PC A08/MF A01.

Simplified, non-computer based methods are presented for predicting photovoltaic array and system performance. The array performance prediction methods are useful for calculating the potential output of passively cooled, flat, south facing max-power tracked arrays. A solar/weather data base for 97 different US and US affiliated stations is provided to aid in these calculations. Also, performance estimates can be made for photovoltaic systems (array, battery, power conditioner) that are backed-up by non-solar reserves capable of meeting the load when the solar system cannot. Such estimates can be made for a total of 41 different sinusoidal, unimodal, and bimodal diurnal load profiles from appropriate graphs included. These allow easy determination of the fraction of the load met by the solar photovoltaic system as a function of array size and (dedicated) battery storage capacity. These performance graphs may also be used for systems without battery storage. Use of array manufacturer's specification sheet data is discussed. Step-by-step procedures, along with suggested worksheets, are provided for carrying out the necessary calculations.

18307 **(SAND—81-7008) Performance warranties for residential and light-commercial photovoltaic systems.** Eisenstadt, M. (Eisenstadt (Mel) and Associates, Inc., Albuquerque, NM (USA)). Apr 1981. Contract AC04-76DP00789. 101p. NTIS, PC A06/MF A01.

The law of warranties is covered primarily by the Uniform Commercial Code and the Federal Magnuson-Moss Warranty Act. Both are analyzed in regard to photovoltaic (PV) systems. Warranties - written, oral, and those implied by law - are discussed. The potential liabilities of manufacturers and sellers of PV equipment are investigated and are perhaps larger than realized. Legal methods to limit such liabilities are discussed. Some states require written warranties for solar energy systems. Presently, PV warranties cover primarily materials, workmanship, and electrical performance; all are highly defective legally, none conform with the Magnuson-Moss Warranty Act, and potential liability under the Uniform Commercial Code is great. Some PV warranties attempt to limit liability improperly and are probably invalid. As PV systems penetrate the market, a need arises for an inexpensive test to check if warranties meet required electrical performance. One test is suggested and discussed. In general, the PV industry lacks understanding of warranty law and its liabilities; this law is examined and specific problems discussed.

18308 **Design procedure for combined photovoltaic/thermal solar collector - heat pump systems.** Venkateswaran, S.R.; Anand, D.K. (Univ. of Maryland, College Park). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 281-285(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A general design procedure for combined photovoltaic/thermal (PV/T) solar collector - series heat pump systems applied to heating and cooling of buildings is presented. Analysis of the PV/T solar collector system on a long term basis indicated that the electrical and thermal performance can be correlated to four dimensionless parameters. These account for the PV/T collector performance characteristics, building energy loads, average ambient temperature, isolation and heat pump performance.

18309 **On air conditioning with photovoltaics.** Kern, E.C. Jr. (MIT, Lexington, Mass). *American Society of Mechanical Engineers, [Paper] ;* No. 79-Sol-26, vp(12 Mar 1979).

A simple solar photovoltaic power system comprised of photovoltaic modules and a vapor-compression air conditioner is described and its performance characteristics are analyzed. The mathematical model expresses the system's cooling capacity as a function of insolation, ambient air temperature, and indoor air temperature. The economics of photovoltaic power systems are generally optimum when the power supply matches exactly the load demand, thus eliminating the need for on-site energy storage or backup power. Correlations between predicted cooling capacities and air conditioning loads are presented as one measure of the economics of air conditioning with photovoltaics. 12 refs.

1407 Solar Thermal Power Systems

REFER ALSO TO CITATION(S) 18303, 18786

18310 **(DOE/ET/20550—T3) Line-focus solar central power systems, Phase I. Monthly technical progress report, 1 August 1979-31 August 1979.** Slemmons, A.J. (SRI International, Menlo Park, CA (USA)). Sep 1979. Contract AT03-76ET20550. 20p. NTIS, PC A02/MF A01.

The work performed during the eleventh month of the Phase I study of the Line-Focus Solar Central Power System is summarized. The conceptual design of a 100 MW/sub e/ system was completed during the reporting period. Annual levelized busbar energy costs of 61 mills/kWh are projected for the 80th plant at an average daily capacity factor of 0.6, making the Line-Focus Central Power System plant competitive with nuclear and coal fired plants. Depending on a coal price escalation rate of 8%, it is estimated that there could be as many as 440 100-megawatt solar thermal power plants built in the Western United States by the year 2010. Even higher coal prices could mean a market penetration into other less sunny parts of the United States. Further cost reduction studies proposed should accelerate the realization of electric energy from the sun.

18311 **(DOE/ET/20550—T5) Line-focus solar central power systems, Phase I. Monthly technical progress report, 31 January 1979-28 February 1979.** Slemmons, A.J. (SRI International, Menlo Park, CA (USA)). Mar 1979. Contract AT03-76ET20550. 33p. NTIS, PC A03/MF A01.

The work performed during the fifth month of the Phase I study of the High Temperature Line-Focus Solar Central Power System is summarized. During the reporting period, the optical and receiver computer analysis programs and parametricized data have been combined in a computer program to give the projected annualized Bus Bar Energy Costs for a specified design. Although some of the data are incomplete or need further refinement, the program has been used to examine the sensitivity of some parameters, and to make preliminary optimizations.

18312 **(DOE/ET/20550—T7) Line-focus solar central power systems, Phase I. Monthly technical progress report, 28 February 1979-31 March 1979.** Slemmons, A.J. (SRI International, Menlo Park, CA (USA)). Apr 1979. Contract AT03-76ET20550. 25p. NTIS, PC A02/MF A01.

The work performed during the sixth month of the Phase I study of the High Temperature Line-Focus Solar Central Power System is summarized. During the reporting period, subsystem and system parametric analyses were essentially completed. The conceptual design of the system has been initiated. Annual levelized busbar energy costs of 59 mills/kWh are projected for the 80th plant.

18313 **(DOE/SF/01982—T1) Continuous-band Nitinol heat engine. Final report.** Johnson, A.D. (Energy Research Associates, Oakland, CA (USA)). Sep 1980. Contract FG03-78SF01982. 30p. NTIS, PC A03/MF A01.

The goals of the research can be summarized thus: to demonstrate feasibility of increasing power output from the continuous-band Nitinol engine by installing multiple wire loops in parallel; to operate this engine in steady-state conditions so that power output could be measured; and to develop a technique for making wires which do not suffer the failure mode of previous welded wires. A fully-instrumented training engine was developed for preconditioning the wires to be used in the multiple-band engine. A specialized wire-rolling mill was built with which a few continuous loops were fabricated starting with annular rings cut from Nitinol plate. Apparatus for measuring the stress-strain-temperature characteristics of naive and trained Nitinol wire was modified to accommodate continuous loops. Torque versus speed curves were measured on the single-wire engine. Internal forces and torques were recorded as naive wires were trained. In conjunction with state-surface measurements (stress, strain, temperature cycles), these measurements reveal how the wires adapt to certain conditions so that power output may increase or decrease as the condition of the Nitinol wire changes due to cycling, and thus change their match to the engine design. Fatigue experiments were run on several wires. Performance of a multiple-band Nitinol engine is documented. A method of fabricating Nitinol wires (which are truly continuous throughout) was demonstrated, and several wires made. (WHK)

18314 **(DOE/SF/10607—T1) Solar repowering system for Texas Electric Service Company Permian Basin Steam Electric Station Unit No. 5. Final report, executive summary.** (Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group). 15 Jul 1980. Contract AC03-79SF10607. 35p. (ESG—80-22). NTIS, PC A03/MF A01.

The conceptual design and economic assessment of a sodium-cooled, solar central receiver repowering system for Texas Electric Service Company's Permian Basin Steam Electric Plant Unit No. 5 are described. As expected, the economic assessment of the specific concept for that site indicates that the cost of energy is greater than that resulting from the burning of natural gas alone in the existing plant (principally as a result of the current cost of heliostats and the scheduled retirement date of Unit No. 5), Favorable economics for similar types of plants can be projected for the future. The annual fuel savings are equivalent to 218,500 barrels of crude oil, with a total dollar value of $21.5 M and $93.6 M for a 7-year life and a 25-year life, respectively. However, it has also been found, from separate studies, that favorable interpretations of the Fuel Use Act and an improved regulatory climate will be necessary for this economic viability to be reached. In particular, a subsidized program to reduce the cost of heliostats to less than $100/m^2 will be needed. All sodium components, except the receiver, are available on the basis of similar-sized or larger components that have been designed, fabricated, tested and operated in power plants for hundred of thousands of hours. Liquid sodium has been demonstrated for use as a stable, safe, and easily contained heat transfer fluid up to temperature exceeding those required for modern steam plants. (WHK)

18315 **(DOE/SF/10763—T5) Programmer's manual for the University of Houston computer code RCELL: cellwise optimization for the solar central receiver project.** Lipps, F.W.; Vant-Hull, L.L. (Houston Univ., TX (USA). Energy Lab.). Sep 1980. Contract AC03-79SF10763. 140p. (SAN—0763-1). NTIS, PC A07/MF A01.

The optical analysis of the central receiver system is concerned with the geometry of the heliostats, their neighborhoods in the collector field, the central receiver and the sun. The code exists in three versions. The cellwise optimization program contains the RCELL subroutine and is referred to as the RC code system. The individual heliostat performance model (for small systems and/or final design studies) is referred to as the IH code system. Systems having more than 2500 heliostats require an impractical amount of core and CPU if they are represented by the IH version. Consequently, a cellwise performance model is maintained that contains a cell model of the collector field. The field cells are square and have a north-south orientation. Hence the cellwise performance model is referred to as the NS code. The RCELL optimization program determines the optimum heliostat spacing parameters in each cell and the optimum trim of the collector field using a detailed cost and performance model for the thermal energy available at the base of the tower. Optimization is based on estimates of thermal system cost and total annual energy available at the base of the tower. The estimate of annual energy depends on the insolation model, the receiver interception fractions which are input to RCELL from a previous NS code execution, and the loss model. The arrangement of heliostats is largely determined by the shading and blocking losses.

18316 **(DOE/SF/10763—T6) Notes on collector field optimization: extensions of the basic theory.** Lipps, F.W.; Vant-Hull, L.L. (Houston Univ., TX (USA). Energy Lab.). Nov 1980. Contract AC03-79SF10763. 63p. (SAN—0763-5). NTIS, PC A04/MF A01.

The RCELL optimization routine for the collector field geometry of the central receiver concept is described. Topics include optimization constrained to fixed annual energy, optimization constrained to fixed azimuthal spacing, optimization including receiver geometry, optimization including power dependent cost, and optimization including new-wiring cost model and operation and maintenance costs.

18317 **(DOE/SF/10763—T7) User's manual for the University of Houston computer code-RC: cellwise optimization for the solar receiver project.** Laurence, C.L.; Lipps, F.W. (Houston Univ., TX (USA). Energy Lab.). Dec 1980. Contract AC03-79SF10763. 233p. (SAN—0763-3). NTIS, PC A11/MF A01.

Optical analysis of the central receiver system is concerned with the geometry of heliostats, their neighborhoods in the collector field, the central receiver and the sun. The University of Houston code is divided into three systems: the NS, RC and IH code systems. The NS code system is for performance analysis of systems with more than 2500 heliostats. It is a cellwise performance model containing a cell model of the collector field where cells are square and have a north-south orientation. Each cell contains a representative heliostat at the cell center which may represent many heliostats. The RC code system contains the primary design method and is a cellwise cost/performance optimization program. It's primary constituent is the RCELL subroutine. The IH code system is used for final performance analysis. This model is capable of representing individual heliostat locations. The optimization program (RCELL) determines the optimum heliostat spacing parameters in each cell and the optimum trim (boundary location) of the collector field using a detailed cost and performance model for the thermal energy available at the base of the tower. Performance factors are annually averaged. Shading and blocking play an important role. Prior to running the optimization code an NS system run to determine the receiver interception fractions is required.

18318 (DOE/SF/10763—T8) Description of the capabilities of the individual heliostat code. Walzel, M.D. (Houston Univ., TX (USA). Energy Lab.). Jul 1980. Contract AC03-79SF10763. 42p. (SAN—0763-2). NTIS, PC A03/MF A01.

The individual heliostat, or IH, computer code developed at the University of Houston is available to define heliostat location coordinates of an optimized collector field, and compute in detail the performance of the defined field. In order for IH to generate optimized fields specified by the RC optimization code, IH requires output from CELLAY. CELLAY is a stand-alone program that takes output from the RC system and generates input for the IH programs. A subroutine called LAYOUT and its associated subroutines are the primary source for generating heliostat location coordinates. Boundaries, slip planes, and deletes are all controlled by specification of key variables which occurs before the general sequence of calculations. The IH performance code is similar to the cellwise performance code (NS) with the sum over cells being replaced by a sum over heliostats. Each heliostat has associated with it several quantities which are calculated and output so that the action of the system can be monitored over the course of time. The IH system of computer programs is a collector field layout and performance code for solar central receiver systems.

18319 (SAND—78-8191) Phase II: heliostat drive mechanism. Final report. Mitchell, W.D.; Maxwell, D.; Morden, D.; Graddy, J.C.; Felix, H.E. (Solaramics, El Segundo, CA (USA)). May 1980. Contract AC04-76DP00789. 133p. NTIS, PC A07/MF A01.

The objective of this project has been to design and test the modified azimuth-elevation heliostat drive mechanism generated by SOLARAMICS in the Low Cost Heliostat Preliminary Design Program. The preliminary design has been scaled up to accomodate a larger heliostat of $50m^2$ (524 sq ft) from the $40m^2$ design. The design effort has stressed development of a mechanism possessing low initial cost and low maintenance. The basic design concept utilizing 2 linear actuators with bell crank linkages has been retained and refined. A full scale assembly has been fabricated and tested to evaluate performance characteristics. The design characteristics, design trade-offs, and test program are detailed. (WHK)

18320 (SAND—79-8182) Prevention of soiling of heliostat surfaces. Final report. Baum, B.; Binette, M. (Springborn Labs., Inc., Enfield, CT (USA)). 5 Dec 1980. Contract AC04-76DP00789. 111p. NTIS, PC A06/MF A01.

The goal of this project was to develop methods for preventing or minimizing soiling of the surface of the glass-mirrored heliostat and the plastic dome over the aluminized Mylar mirror and also to facilitate the cleaning process. The substrates used in this project were float glass, Kynar, and Petra A polyester. The two general classes of compounds which were being investigated were antistatic and antisoiling agents. The categories of antistatic agents used were amine derivatives, quaternary ammonium salts, phosphate esters, and polyethylene glycol esters. The soil-release agents were either hydrophilic ionic or hydrophilic nonionic in character. These compounds were attached to the substrate surface by silane or titanate coupling agents or as a mixture with a hard, weather-resistant coating. The silanol groups on the surface of glass provided suitable attachment sites; whereas, the plastic substrates required activation by various procedures. Another route to these objectives lay in direct reaction of an organic compound with a functional group in the glass surface. Evaluation of the various coatings on the three substrates was accomplished by a sequential screening procedure. The tests were performed in the following order with ineffective materials eliminated at each step: (1) clarity, (2) adhesion, (3) antisoiling properties, (4) abrasion resistance, and (5) permanence. Dust was removed by a high velocity air stream, an air stream in conjunction with gentle brushing, or by small amounts of water at low pressure. Finally, a water wash apparatus was designed and examined for efficiency of dust removal.

18321 (SAND—81-8008) Testing of the prototype heliostats for the solar thermal central receiver pilot plant. (Sandia National Labs., Livermore, CA (USA); Sandia National Labs., Albuquerque, NM (USA)). Apr 1981. Contract AC04-76DP00789. 232p. NTIS, PC A11/MF A01.

As part of the competition for production of heliostats for the pilot plant, the Martin Marietta Corporation and the McDonnell Douglas Astronautics Company each built prototype heliostats and components (drive mechanisms and mirror modules) which were subjected to an extensive test program by Sandia National Laboratories in 1979. An overview of the tests and their results are presented. Heliostat and controls tests, structural tests on the drive mechanism, environmental drive assembly tests, and mirror module tests are reported. (WHK)

18322 (SERI/CP—761-1077(Vol.1), pp 185-197) System design for a commercial solar Brayton cycle central receiver water desalination plant. Laakso, J.H.; Zimmerman, D.K. (Boeing Engineering and Construction, Seattle, WA). Mar 1981. NTIS, PC A12/MF A01.

From Solar desalination workshop; Denver, CO, USA (23 Mar 1981).

The system design for a future commercial solar energy brackish water desalination plant is described. Key features of the plant are discussed along with its configuration selection rationale, design objectives, operation, and performance. The water treatment technology used in the plant is ion exchange pretreatment and single stage reverse osmosis desalination utilizing high-flux membranes. Electrical power needed for plant operation is provided by a solar energy system which is based on the Brayton cycle having air as the working fluid. Primary solar system components are: heliostat field, central cavity-tube receiver, receiver support tower, thermal energy storage, and a commercial gas turbine generator set. The thermal energy storage subsystem is of the sensible heat brick type and provides a capability for continuous day/night power generation during most weather conditions. This system design was selected in a study of various system alternatives and their life cycle product water costs for a representative site in western Texas.

18323 (UCLA—12/1279) Community applications of small-scale solar-thermal energy systems. Baldwin, J.H.; Steinberg, C.; Stea, D. (California Univ., Los Angeles (USA). Lab. of Biomedical and Environmental Sciences). Feb 1981. Contract AC03-76SF00012. 177p. NTIS, PC A09/MF A01.

Rapid technological development of small scale solar thermal energy systems (STES) may bring them on line before communities are adequately prepared for them. Information for analyzing and siting STES is presented along with discussions of community applications, regulations, impacts and incentives. By providing this information to community planners, it is hoped that barriers to STES utilization can be anticipated and mitigated.

18324 Review of the US Department of Energy's Solar Thermal Program. Braun, G.W. (US DOE). pp 113-120 of Proceedings--region 6 conference, the 1980's--a forest of energy decision trees. Piscataway, NJ; IEEE (1980).

From IEEE Region 6 conference; San Diego, CA, USA (20 Feb 1980).

The U.S. Department of Energy Solar Thermal Program involves phased research and development activities to assist U.S. industry in establishing the technical and cost readiness of mid-and high-temperature solar-concentrating collector systems.

18325 International solar engineering development for thermal power conversion systems, April 1980. Herwig, L.O. (Dept. of Energy, Arlington, VA). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 151-160(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A summary of worldwide activities in the engineering development and testing of solar thermal power conversion systems based upon the central receiver system concept is presented. The nine central receiver system experiments and pilot plants now operating or under construction around the world having thermal output powers of about 1 MW (megawatt) or more are discussed. Two systems are now in operation - one in France and one in the United States. Seven more are in various stages of construction with initial operation scheduled for 1981 or 1982. They are located in the United States, Japan, Spain (2), Italy, France, and the USSR. In totality, they represent a very substantial world investment (at least $250 million) in a high technology approach to the utilization of solar energy in the production of electricity and high-tempera-

ture process heat. Summaries and comparisons of central receiver designs to be tested in the early 1980's are presented in an effort to communicate the scope of development efforts. This breadth of world interest in central receiver technology can lead to more rapid progress toward economic systems and application. However, it can also lead to unncessary duplication of world efforts, implying a potential waste of scarce solar development resources. In any case by the mid-1980's, the diversity of approaches now underway and the ingenuity of the engineers and scientists involved should provide a solid basis for determining the potential capabilities and the roles of central receiver systems in future power production.

18326 **Central receiver - past, present, and future.** Eicker, P.J. (Sandia Labs., Livermore, CA). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 161(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

18327 **Cryogenic heat transfer tunnel: first experimental data.** Clark, G.L. Jr.; Clausing, A.M.; Mueller, M.H.; Weiner, J.G.; Kempka, S.N. (Univ. of Illinois, Urbana). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 481-484(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The UIUC Cryogenic Heat Transfer Tunnel was built to exploit the spectacular gains in Reynolds and Grashof numbers which occur when convective experiments are performed at cryogenic temperatures. The program was motivated by the need to predict the convective loss from external solar thermal-electric receivers which will typically operate in the combined convection regime with Reynolds numbers above 10^6 and Grashof numbers exceeding 10^{11}. The tunnel facility is currently operational and forced convection heat transfer data have been taken from a vertical cylinder in cross-flow. The results of these validation tests indicate that the heat transfer coefficients measured are completely dependent upon the traditional non-dimensional parameters of forced convection.

18328 **Current operational results from the shallow-well solar irrigation system at Willard, New Mexico.** Fenton, D.L.; Krivokapich, G.; Chilton, V.; Abernathy, G.H.; Ellibee, D.E. (New Mexico State Univ., Las Cruces). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 515-518(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The capacity of the Willard Solar Power system is 19 kW (25 hp) and is capable of producing both the mechanical and electrical power. During the peak of the irrigation season, July 1979, the system pumped 60 percent of the 35,300 m^3 (28.6 acre-feet) of water deliverd. The power system involves east/west tracking parabolic trough collectors, thermal energy storage sufficient for 20 hours of system operation and an organic Rankine cycle engine where the operating efficiencies are 20 percent near winter solstice for the collector fields, 12 to 15 percent for the engine and 5 to 6 percent as an overall system efficiency. Significant maintenance time was expended on both the collector and power systems throughout the operational period.

18329 **Design, construction, and operation of a solar-powered 150 kW irrigation facility.** Matteo, M.A.; Rafinejad, D. (Acurex Corp., Mountain View, CA). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 519-523(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Acurex Corporation has designed, constructed, and started up a solar-powered experimental facility to provide 150 kW of electric power for operating deep-well irrigation pumps. Located on the Dalton Cole farm near Coolidge, Arizona, this facility is presently the largest operating solar thermal power plant in the world. Experience gained on this plant will pave the way for many future solar-powered generation facilities. The system uses Acurex parabolic trough collectors. The collected solar thermal energy is converted to electricity by an organic Rankine cycle unit and a high efficiency generator. The system was first operated on September 21, 1979. Since then, a good system operating record has been achieved. The results of performance tests of the thermal storage and power generation subsystems compare favorably with design predictions.

18330 **Small community solar thermal power experiment.** Marriott, A.T.; Kiceniuk, T. (Jet Propulsion Lab., Pasadena, CA). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 524-528(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The first solar thermal power plant specifically designed as an alternate source of electric energy for small communities in this country is now in its second phase of development. As a result of Phase I concept definition studies, a decision was made to pursue a parabolic dish system using distributed generation. Both the design approach and the site selection status are described. The concentrator is a parabolic dish developed by the General Electric Company under the Low Cost Concentrator activity within the Module Development element of the JPL Solar Thermal Power Systems Project. It is a first generation concentrator using a reflective film bonded to a reinforced plastic substrate. The receiver is designed to heat an intermediary heat transfer fluid and is a new approach being developed by Ford. The power conversion subsystem will employ a Rankine engine. The Phase II effort will include design, development, and verification testing. This is a two-year activity that will provide a system design including the plant control system and other balance of plant considerations. The verification testing will be at the JPL Edwards AFB Parabolic Dish Test Site. Testing will be conducted at the module level; that is, a complete concentrator, receiver, and engine assembly test is planned. Phase II will follow with fabrication, installation, and operation of the power plant in the selected community to occur in 1983.

18331 **Thermal energy conversion to motive power.** Meador, J.T. (Oak Ridge National Lab., TN). Contract W-7404-ENG-26. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 534-538(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Performance evaluations of both ideal and actual organic Rankine cycle (ORC) and steam Rankine cycles (SRC) are presented for systems that may be candidates for Solar Total Energy Systems (STES). Many organic fluids and heat engines (turbines or expanders) are being developed; therefore, performance of a few representative ORCs are evaluated. The electrical power outputs range from several kW to <10 MW with maximum cycle temperatures of 482°C (900 F). Conclusions from basic Rankine cycle analyses are that the Carnot cycle concept should not be used as a standard of comparison for different cycle fluids, even when they are operating at the same inlet and exhaust temperatures. The ideal Rankine cycle with the maximum conversion efficiency, when based on exact physical properties of fluids, should provide a better standard for actual cycles. Three sets of maximum (ideal) Rankine cycle efficiency (n/sub r/) curves are estimated for steam and several organic fluids for exhaust temperatures of 38°C, 100°C, and 149°C (100 F, 212 F, and 300F). These curves of n/sub r/ versus peak temperature at the expander inlet are referred to as Criterion Curves for basic Rankine cycles, in which corresponding inlet pressures are selected such that n/sub r/ will be a maximum. Basic cycle efficiencies indicate some fluids preferred for solar total energy applications.

18332 **Dispersed solar thermal generation employing parabolic dish-electric transport with field modulated generator systems.** Ramakumar, R. (Oklahoma State Univ., Stillwater); Bahrami, K. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 539-543(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The application of field modulated generator systems (FMGS) to dispersed solar-thermal-electric generation from a parabolic dish field with electric transport is discussed. Each solar generator unit is rated at 15 kWe and the power generated by an array of such units is electrically collected for insertion into an existing utility grid. Such an approach appears to be most suitable when the heat engine rotational speeds are high (>6000 r/min) and, in particular, if they are operated in the variable speed mode and if utility-grade ac is required for direct insertion into the grid without an intermediate electric energy storage and reconversion system. Predictions of overall efficiencies based on conservative efficiency figures for the FMGS are in the range of 25% and should be encouraging

to those involved in the development of cost-effective dispersed solar thermal power systems.

18333 High-flux sodium-cooled solar absorber concept for central receiver power plants. Pomeroy, B.D. (General Electric Co., Schenectady, NY); Roberts, J.M.; Narayanan, T.V. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 558-562(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

For cylindrical receivers with a capacity of about 400 MW, an aim-at-the-belt focusing strategy can produce average fluxes the order of 0.5 MW/m^2 with peaks as high as 2 MW/m^2. An absorber concept is described which uses liquid sodium coolant and a three-header configuration to efficiently capture this solar power. The mechanical design of this absorber is discussed and thermal performance estimates are presented showing the solar-capture efficiency over a range of solar intensities. The sodium-flow characteristics and some potential flow-control problems are also described. A thermal-stress analysis is presented which shows that a limiting factor on the flux capability may be tube-wall creep/fatigue failure and not the heat-transfer capability of sodium.

18334 Solar-fossil combined cycle power plant. Darnell, J.R.; Lam, E.Y.; Westsik, J.H. (Bechtel National, Inc., San Francisco, CA). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 563-567(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The results of a DOE-funded study of solar-fossil hybrid power systems are summarized. The concept uses an air-cooled central receiver, with the collected solar energy displacing a portion of the fossil fuel requirements of a combined cycle power plant. The conceptual design of a first of its kind commercial size (112.6 MWe) power plant is described. Operational and performance characteristics and cost estimates of this plant are presented. An assessment of this concept shows significant technical advantages and a potential for utility application by the year 1990.

18335 Energy costs and equivalent cost goals in large solar central receiver and photovoltaic plants. Fish, M.J. (Sandia National Labs., Livermore, CA). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 572(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

18336 Solar one: a 10-megawatt solar thermal central receiver pilot plant. Reeves, J.N. (Southern California Edison Co., Rosemead); Schweinberg, R.N. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 578-580(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Through a cooperative effort of government and private industry, a 10-megawatt solar thermal pilot plant is to be constructed in the 1980 to 1981 time frame using central-receiver technology. The pilot plant will be tested for five years and information derived will be used for future commercial solar generating stations.

18337 Definition of the heliostat array for the Barstow 10 MWe Pilot Plant. Vant-Hull, L.L. (Univ. of Houston, TX). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 581-585(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The Barstow Pilot Plant is designed to emulate a 100 MWe commercial power plant in as many aspects as possible, while still providing experience with realistic components. A radial-stagger array of 1818 heliostats has been defined for the Pilot Plant, subject to the site specific constraints, which retains all the characteristics of a commercial scale surround field.

18338 Short term effect of cloud transits on the Barstow Central Receiver Pilot Plant. Laurence, C.L. (Univ. of Houston, TX). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 586-590(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A cloud transit study has been performed to determine the impact of clouds on receiver design. Because of a lack of significant statistical data on cloud events, the cloud formations are chosen from actual data being taken at the Barstow site. Selection is made with the purpose of representing both typical and extreme situations. The cloud data is translated into a computer subroutine that forms the effective optical transmission of the cloud field as a function of location. The data selected and analyzed represents approximately ten minute time periods where the clouds significantly impact the receiver flux. The flux variations during such a period are expected to have the most impact on receiver design, whereas, the effects of clouds over longer time periods are of more interest in developing control scenarios. The results from the simulation for five cloud events are presented. The power levels and rates of change of power levels are determined. The horizontal gradients across panels (around the receiver) are of great importance in the receiver design. The effect of cloud passages on the level of these gradients and changes in the gradients are reported and examined.

18339 Solar central receiver integration with Hoover Dam. Remmers, H.E. (Water and Power Resources Service, Denver, CO); Zelenka, R.L.; Kitchen, J.H. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 591-595(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The technical and economic feasibility of integrating a 100 MWe solar central receiver powerplant located in Yuma, Arizona with the Hoover Dam hydroelectric power system is discussed. Technical feasibility was determined by evaluating the effects of integration on the hydrologic and power operations of the existing hydro system. Economic feasibility was determined by comparing the costs of the integrated system with that of the most likely alternative source of power generation--an oil-fired,combined-cycle plant.

1408 Ocean Thermal Gradient And Salinity Gradient Power Systems

18340 (DOE/CH/10030—1) Effect of microfouling on heat-transfer efficiency. Little, B.; Berger, L.R. (Naval Ocean Research and Development Activity, Bay Saint Louis, MS (USA)). 1980. Contract AI02-79CH10030. 34p. (CONF-8005157—1). NTIS, PC A03/MF A01.

From 5. international congress on marine corrosion and fouling; Barcelona, Spain (May 1980).

Field experiments, performed at Keahole Point, Hawaii and in the Gulf of Mexico, were designed to determine the relationship between decreased heat transfer efficiency and the accumulation of corrosion and/or biofouling films on heat exchanger surfaces. The sample tubes were maintained under conditions simulating those of an Ocean Thermal Energy Conversion (OTEC) system and data from the two sites have been compared. Seawater flowed through 2.54 (internal diameter) metal tubes at approximately 1.8m sec^{-1}. Four types of tubes were used: 5052 Aluminum (A1), Grade 2 titanium (Ti), 90-10 copper-nickel (Cu-Ni) and Allegheny-Ludlum 6X stainless ssteel (SS). All surfaces were colonized by microorganisms, though colonization of the Cu-Ni surface was initially retarded. Total film weight was greatest for the Al and Cu-Ni surfaces which were characterized by corrosion as well as microbial fouling. The total organic carbon: total nitrogen ratios of the fouling films from Ti, Al, SS and Cu-Ni, 4.2, 4.0, 4.8 and 7.9 respectively, remained constant throughout the experiment. The degradation of heat transfer efficiency due to the formation of fouling layers on Ti and SS is neither linear nor a simple exponential function. A microfouling model is proposed for corrosion-resistant surfaces that is consistent with field observations.

18341 (DOE/ET/20612—T1) Gulf of Mexico numerical model. Project summary. Blumberg, A.F.; Mellor, G.L.; Herring, H.J. (Dynalysis of Princeton, NJ (USA)). Feb 1981. Contract AC02-78ET20612. 21p. NTIS, PC A02/MF A01.

The objective of this investigation is to develop and assess the skill of a three-dimensional, prognostic numerical model of the Gulf of Mexico and to identify the thermal impact of operating OTEC (Ocean Thermal Energy Conversion) power plants on the

physical environment. The investigation consists of the following technical elements: adaptation and refinement of an existing multilayer numerical model to the Gulf of Mexico basin, including realistic boundary conditions and bottom topography, to predict the time dependent circulation and temperature distribution in the Gulf throughout the year; comparison of the model predictions with the observed features of the Gulf; and application of the model to the case of OTEC power plants in the Gulf to estimate the physical perturbations to the environment.

1409 Solar Thermal Utilization

REFER ALSO TO CITATION(S) 18247, 18248, 18296, 18308, 18308, 18438, 18439, 18441, 18442, 18443, 18448, 18451, 18487, 18487, 18828, 18842, 18844, 18866, 19363, 19364

18342 (ANL-K—80-55) Economic analysis of commercial solar water-heating systems. (Mueller Associates, Inc., Baltimore, MD (USA)). 23 Sep 1980. Contract W-31-109-ENG-38. 71p. (MAI—203). NTIS, PC A04/MF A01.

A brief description is given of a typical commercial solar water heating system, outlining typical cost and performance levels. The economic performance of solar energy systems is described through the use of Cash Flow Diagrams. The economic performance of solar energy systems is described through the calculation of equivalent Return-On-Investment (ROI). Appendices are included that enable one to calculate the ROI for any particular solar hot water system investment. (MHR)

18343 (CONF-800483—(Vol.1), pp 268-272) **Solar roof cooling by evaporation.** Patterson, G.V. (Fanjet Solar Roof Cooling Co., Columbia, SC). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Evaporation is nature's way of cooling. By spraying a light film of water in the form of a mist for thirty seconds, then turning the sprays off for five minutes while evaporation takes place, the roof temperature can be reduced from 165° to 88°. Roof air conditioning load is reduced by 85% to 90%. The cooler roof also protects and extends roof life. The basic facts of this technique are examined. The economic and energy savings are described. Other ancillary benefits of the system are: (1) the controller is equipped with a manual fire switch that overrides the thermostat and sprays the roof continuously in the event of a fire, and (2) the copper tubing serves as an excellent lightning arrestor.

18344 (DOE/AL/04236—T1) Integration and validation of the DEROB and PASOLE computer programs for the simulation of passive solar heating and cooling of buildings. Final report. Arumi-Noe, F. (Texas Univ., Austin (USA). School of Architecture). Mar 1979. Contract FG04-78AL04236. 4p. NTIS, PC A02/MF A01.

The program was validated against data in seven of the Los Alamos test rooms. General comments are presented on the advantages and disadvantages of the program. (MHR)

18345 (DOE/CS/30242—4) Passive solar heating of building with attached greenhouse. Final report, August 31, 1979-August 30, 1980. Jones, R.W. (South Dakota Univ., Vermillion (USA)). Aug 1980. Contract AC02-79CS30242. 39p. NTIS, PC A03/MF A01.

Research has been conducted on the attached-greenhouse type of passive solar heating system in the north-central region. The thermal performance of attached-greenhouse buildings was analyzed in order to determine the component sizes and configurations which optimize performance. The analytical method is dynamic computer simulation using a thermal network model and actual hourly meteorological and solar radiation data from the north-central region. The project has consisted of a large number of computer simulation runs and resulting performance estimates for certain designs. Conclusions on design guidelines emerge from the results. The overall result of the project is the development of specific design guidelines useful to architects and builders.

18346 (DOE/CS/30329—T1) Passive solar commercial buildings: design assistance and demonstration program. Phase 1. Final report. (Pease (J.N.) Associates, Charlotte, NC (USA)). 26 Jan 1981. Contract FC02-80CS30329. 284p. NTIS, PC A13/MF A01.

The final design of the Mount Airy Public Library is given. Incremental passive design costs are discussed. Performance and economic analyses are made and the results reported. The design process is thoroughly documented. Considerations discussed are: (1) building energy needs; (2) site energy potentials, (3) matching energy needs with site energy potentials, (4) design indicators for best strategies and concepts, (5) schematic design alternatives, (6) performance testing of the alternatives, (7) design selection, and (8) design development. Weather data and Duke Power electric rates are included. (LEW)

18347 (DOE/CS/30336—1) Deadwood Community Center and Firehall, Deadwood, Oregon. Phase I. Design documentation report. Brown, G.Z.; Kellett, R.; Reynolds, J.S. (Equinox Design, Inc., Eugene, OR (USA)). 1980. Contract FC02-80CS30336. 237p. NTIS, PC A11/MF A01.

The energy related portions of an architectural design process for a passive solar heating system that directly incorporated the needs, values, and aspirations of the people who will construct and use the buildings are described. The design process and the documentation and evaluation of the final design are presented. (MHR)

18348 (DOE/CS/30339—1) Gunnison County Airport Terminal solar cooperative agreement. Waller, L.H.; Kreider, J.F. (Associated Architects of Crested Butte, CO (USA)). 1981. Contract FC02-89CS30339. 39p. NTIS, PC A03/MF A01.

The results of solar system performance studies carried out on the final construction of a passive space heating system for the Gunnison County Airport Terminal are presented. The principal topic discussed is the economic performance of the system with supporting material on thermal performance and system design. The conclusions of this study, using the methods of computer modeling and life-cycle economics are: (1) the final design passive solar heating system with night insulation will provide, on the average, 41% of the annual heating load for the terminal, (2) the passive system will result in a saving of 154 million Btu per year or, equivalently, 45,122 kWh per year, and (3) over a 40-year period the system is expected to save 3.1 million dollars in heating energy costs after the solar system investment has been paid off. Over the first 20-year period the net savings are approximately $100,000. The simple payback period is 13 years.

18349 (DOE/CS/30361—T2) Willow Park II Community Center. Overview of the design report for the passive solar commercial buildings design assistance and demonstration program. (Interactive Resources, Inc., Point Richmond, CA (USA)). 15 Jan 1981. Contract FC02-80CS30361. 23p. NTIS, PC A02/MF A01.

The final design of the 4130 sq ft community center is briefly reviewed. Incremental passive design costs are broken down and tabulated. Energy consumption by various components is computed by the ENERGYLOOK computer program, and the final design's energy use is computed with the DOE-2,0A program. Results of these computations are shown graphically. Life-cycle values are computed using the VISICALC program, and the economic analysis results are tabulated. Design drawings are included. Incremental solar construction cost estimates are tabulated. (LEW)

18350 (DOE/CS/31596—T1) Assessment of needs for new controllers. Final report. Kent, T.B.; McGavin, M.J., Lantz, L. (Solar Control Corp., Boulder, CO (USA)). Jul 1980. Contract AC03-77CS31596. 28p. (SAN—1596-2). NTIS, PC A03/MF A01.

A survey was conducted to evaluate currently available controllers for solar systems and to determine the need for new control devices and for improvements to present ones. A detailed discussion of the survey results is included and individual responses to the survey are listed. Present domestic water controls; space heating controls; multi-mode controllers; variable flow vs Bang-Bang control; swimming pool and spa controllers; testing and certification;

cost improvement; installation and test instructions; microprocessors; and government participation are discussed. Part 1 concludes with recommendations for possible future research efforts. (MCW)

18351 **(DOE/CS/32127—T1) Solar heating system at the office of Burns/Peters Architects. Final technical report.** (Bickle/CM, Inc., Albuquerque, NM (USA)). 18 Jun 1979. Contract FC03-78CS32127. 41p. NTIS, PC A03/MF A01.

A 6000 ft² office building is described which uses 820 ft² of concentrating, tracking solar collectors for domestic water heating and part of the space heating. The piping schematic, major maintenance and construction problems, system performance data, acceptance test, and operation and maintenance manual are included. (MHR)

18352 **(DOE/CS/34138—T1) Experiments with structural concrete blocks which double as solar air heaters. Final report.** Payne, P.R.; Brown, J.P. (Payne, Inc., Annapolis, MD (USA)). 1979. Contract FG04-77CS34138. 72p. NTIS, PC A04/MF A01.

Because concrete is a low cost, low energy content material, and because many buildings have unobstructed south-facing walls, the concept of an air heating structural block was evolved. Four configurations are described, two routinely available from concrete block manufacturers, and two specially designed. Test walls were evaluated heating ambient air in a single pass, so the temperature difference was low. With that reservation, there was little difference between any of the configurations (one of the special designs was best) or between the blocks and conventional solar air heaters.

18353 **(DOE/CS/34153—4) Suncatcher and cool pool. Project report.** Hammond, J. (Living Systems, Winters, CA (USA)). 1 Mar 1981. Contract FG04-77CS34153. 104p. NTIS, PC A06/MF A01.

The Suncatcher is a simple, conical solar concentrating device that captures light entering clerestory windows and directs it onto thermal storage elements at the back of a south facing living space. The cone shape and inclination are designed to capture low angle winter sunlight and to reflect away higher angle summer sunlight. It is found that winter radiation through a Suncatcher window is 40 to 50% higher than through an ordinary window, and that the average solar fraction is 59%. Water-filled steal culvert pipes used for thermal storage are found to undergo less stratification, and thus to be more effective, when located where sunlight strikes the bottom rather than the top. Five Suncatcher buildings are described. Designs are considered for 32°, 40° and 48° north latitude, and as the latitude increases, the inclination angle of the cone should be lowered. The Cool Pool is an evaporating, shaded roof pond which thermosiphons cool water into water-filled columns within a building. Preliminary experiments indicate that the best shade design has unimpeded north sky view, good ventilation, complete summer shading, a low architectural profile, and low cost attic vent lowers work. Another series of experiments established the satisfactory performance of the Cool Pool on a test building using four water-filled cylinders, two cylinders, and two cylinders connected to the Cool Pool through a heat exchanger. Although an unshaded pool cools better at night than a shaded one, daytime heat gain far offsets this advantage. A vinyl waterbag heat exchanger was developed for use with the Cool Pool. (LEW)

18354 **(DOE/CS/34495—T1) Solar-MEC Development Program. Project 61019 annual report, September 1, 1977-September 30, 1978.** Wurm, J.; Kinast, J.A.; Rush, W.F. Jr., Zawacki, T.S.; Macriss, R.A. (Institute of Gas Technology, Chicago, IL (USA)). Oct 1979. Contract AC03-77CS34495. 80p. NTIS, PC A05/MF A01.

The SOLAR-MEC is the most advanced open-cycle, solid-desiccant heating/cooling system being considered for solar applications. Based on the results of field tests with several residential-size units, begun in early 1975, a 2-year program has been under way. Details of the accomplishments during the first year of the project (FY 1978) are presented which include: (1) development of data necessary to model the dynamic performance of the desiccation process of the SOLAR-MEC system; (2) mathematical description (modeling and computer programs) of the component processes of the system namely, desiccation, heat exchange, and evaporative cooling; (3) development and evaluation of several design improvements to increase seasonal cooling efficiency and capacity (namely, staged regeneration of the desiccant wheel and unbalanced-flow design of the heat exchanger wheel); (4) investigation and redesign of air-seals, wheel support, and drive mechanisms, and of air distribution (including the selection of high efficiency fans) to reduce parasitic power consumption of motor-blower assemblies; (5) investigation of the long-term stability of the rotary heat exchanger wheel performance including the selection of a low-cost alternative matrix; and (6) investigation and liaison activity for the selection of a practical non-asbestos molecular-sieve support matrix for the desiccant. (WHK)

18355 **(DOE/IR/05106—2) Decision process for the retrofit of municipal buildings with solar energy systems: a technical guide.** (Public Technology, Inc., Washington, DC (USA); Los Angeles, City of, CA (USA)). Nov 1980. Contract FG02-78IR05106. 212p. NTIS, PC A10/MF A01.

As a background for solar applications, the following topics are covered: solar systems and components for retrofit installations; cost, performance, and quality considerations; and financing alternatives for local government. The retrofit decision process is discussed as follows: pre-screening of buildings, building data requirements, the energy conservation audit, solar system sizing and economics, comparison of alternatives, and implementation. Sample studies are presented for the West Valley Animal Shelter and the Hollywood Police Station. (MHR)

18356 **(DOE/NASA/CR—161675) Solar space and water heating system installed at Charlottesville, Virginia.** (National Aeronautics and Space Administration, Huntsville, AL (USA). George C. Marshall Space Flight Center). Sep 1980. Contract AB01-77CS30010. 101p. NTIS, PC A06/MF A01.

The solar energy system located at David C. Wilson Neuropsychiatric Hospital, Charlottesville, Virginia, consists of 88 single glazed, Sunworks Solector copper base plate collector modules; hot water coils in the hot air ducts; a domestic hot water (DHW) preheat tank; a 3,000 gallon concrete urethane-insulated storage tank and other miscellaneous components. This report includes extracts from the site files, specifications, drawings, installation, operation and maintenance instructions.

18357 **(DOE/SF/02005—T1) Solar powered circulation pump development. Final report.** Johnson, A.L. (Johnson (Alfred L.), Manhattan Beach, CA (USA)). Sep 1980. Contract FG03-78SF02005. 64p. NTIS, PC A04/MF A01.

An iterative design and evaluation process was undertaken to develop a prototype solar powered liquid circulation pump. The first effort was to review the state-of-the-art of liquid piston heat engines. Next a morphological analysis of the original concept was performed. An analysis of the pump performance from a theoretical basis was performed by deriving and solving the equations governing the cycle. The results are documented. An experimental evaluation of the condensing phenomena was performed. The design of the boiler was then undertaken. This effort showed a fundamental physical limitation imposed by the original geometry and the physics of water boiling. In an effort to resolve this problem, a number of alternate configurations were examined, with the result being that the boiler and heat pipe elements of the design were entirely eliminated. In their stead it was assumed that the boiling could be conducted in the solar panel. A number of solar panel designs were examined, and the most appropriate type of solar panel is described in the appendix. A 1/4th scale unit was fabricated and tested. The overall efficiency was approximately 1% at the design point, compared with a theoretical limit of 1.6% for the given operating conditions. The production costs of the full size pump were examined. Finally systems integration aspects were considered and the results presented.

18358 **(LA-UR—81-903) Physics of passive solar buildings.** Balcomb, J.D. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 7p. (CONF-810627—1). NTIS, PC A02/MF A01.

From American Society for Engineering Education annual conference; Los Angeles, CA, USA (22 Jun 1981).

Primary emphasis in the paper is on methods of characterizing and analyzing passive solar buildings. Simplifying assumptions

are described which make this analysis tractable without compromising significant accuracy or loss of insight into the basic physics of the situation. The overall nature of the mathematical simulation approach is described. Validation procedures based on data from test rooms and monitored buildings are outlined. Issues of thermal comfort are discussed. Simplified methods of analysis based on correlation procedures are reported and the nature of the economic conservation-solar optimization process is explored. Future trends are predicted.

18359 **(LA-UR—81-987) One-dimensional model of the dynamic layer behavior in a salt-gradient solar pond.** Meyer, K.A. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 6p. (CONF-810509—27). NTIS, PC A02/MF A01.

From Annual conference of the International Solar Energy Society; Philadelphia, PA, USA (26 May 1981).

A numerical model has been developed to describe the time-dependent behavior of the interfaces between the convecting and nonconvecting regions of a salt gradient solar pond. Salinity and temperature profiles, as functions of time, are also determined by the model. The model utilizes empirical correlations from the oceanographic literature that describe the heat and salt fluxes across the interfaces. We find agreement of the calculated behavior with observations made on laboratory-scale solar pond simulation experiments.

18360 **(LA-UR—81-988) Performance of low-mass, sun-tempered buildings.** Wray, W.O. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 6p. (CONF-810509—14). NTIS, PC A02/MF A01.

From Annual conference of the International Solar Energy Society; Philadelphia, PA, USA (26 May 1981).

A sun-tempered building is one that departs from conventional residential construction in only three respects: (1) the long side of the building faces south, (2) approximately 80% of the total window area that is ordinarily used is placed on the south side of the building, and (3) all windows are double glazed. If a house that has been so modified happens to have a contrete floor slab that is not thermally isolated by carpets, its performance may be estimated by previously reported Solar Load Ratio (SLR) correlations for thermally massive direct gain buildings. The approximate performance vs mass sensitivity curves can be used to adjust the performance estimate. However, if no floor slab is present, the sun-tempered building has too little mass to be amenable to analysis by the standard high-mass correlations. The performance of sun-tempered buildings in the low-mass category is analyzed herein and found to be improved relative to conventional structures but inferior relative to high-mass designs.

18361 **(NCEI—0030) Assessment of active solar systems in the residential sector of North Carolina: 1974-1995.** Brown, D.; St. John, K. (Duke Univ., Durham, NC (USA)). 1 Feb 1981. 55p. NTIS, PC A04/MF A01.

An evaluation is presented of the contribution active solar systems can make in North Carolina's residential sector over the next 15 years. The report is divided into 5 parts: Introduction; current solar industry status; projected use of active solar systems to 1995; maximum potential for active solar systems to 1995; recommendations for state solar incentives. Information in the appendices includes: conversion methodology: square feet of collector to Btu; economic analysis of solar systems based on life costs; methodology for percentage breakdowns on projected solar system sales; North Carolina solar manufacturers/distributors and national manufacturers; solar legislation; economic analysis of solar systems using the F-chart simulation program; and data sources. (MCW)

18362 **(SERI/CP—761-1077(Vol.1)) Solar desalination workshop: proceedings.** (Solar Energy Research Inst., Golden, CO (USA)). Mar 1981. Contract AC02-77CH00178. 272p. (CONF-810353—(Vol.1)). NTIS, PC A12/MF A01.

From Solar desalination workshop; Denver, CO, USA (23 Mar 1981).

Sixteen papers are included. A separate abstract was prepared for each one. (MHR)

18363 (SERI/CP—761-1077(Vol.1), pp 13-31) **Overview of solar desalination technologies.** Kreith, F.; Luft, W. (Solar Energy Research Inst., Golden, CO). Mar 1981. NTIS, PC A12/MF A01.

From Solar desalination workshop; Denver, CO, USA (23 Mar 1981).

Providing adequate water is becoming a serious problem in arid areas as the population of the world increases. In many arid areas saline or brackish water is available, but desalination is necessary to make it potable or useful for irrigation. In 1977 the worldwide desalination capacity was 4 million m^3/day, provided by 1500 plants of over 100 m^3/day capacity. The capacity in the United States was 400,000 m^3/day, provided by 510 plants. At present most of these plants are powered by conventional fossil fuels directly or by electric energy from a grid system; only a few small systems are powered by solar energy. However, renewable solar resources can be used in a variety of ways to supply energy for desalination. The most important solar desalination methods and the solar technologies which can supply the heat and power necessary for desalination are discussed.

18364 (SERI/CP—761-1077(Vol.1), pp 143-157) **Desalination for municipal supply.** Altinbilek, H.D.; Akyurt, M. (King Abdulaziz Univ., Jeddah, Saudi Arabia). Mar 1981. NTIS, PC A12/MF A01.

From Solar desalination workshop; Denver, CO, USA (23 Mar 1981).

Water requirements in municipalities as well as factors affecting demand are reviewed. Consumption and its relation with demand are discussed. Variations in demand are explained, using examples from Saudi Arabia. Various ways of meeting the water demand and the design of municipal systems for meeting the variations in demand are briefly reviewed. Water demand and supply in Saudi Arabia is studied, including projections into the future. The role of desalinated water in meeting the present and future demand in the Kingdom is stressed. The plans of the Kingdom to build two solar plants, one for desalination of sea water and the other for brakish water, are reported. It is observed in conclusion that solar desalination has a promising future in the Kingdom as well as in other areas with acute water shortages, provided that solar technology has matured sufficiently to meet the challenges involved.

18365 **(SERI/SP—721-1135) Energy-conserving and passive-solar construction details.** Taylor, R.D. (Solar Energy Research Inst., Golden, CO (USA)). Apr 1981. Contract AC02-77CH00178. 30p. NTIS, PC A03/MF A01.

Diagrams are presented which show construction details for insulating foundations, walls, joists, roofs, and other components of energy-conserving residential and light commercial buildings; glazing systems; installing thermal mass; rock beds; and a passive hot air collector. The emphasis is on using commercially available building materials in new applications to minimize costs and maximize thermal design. The costs are given which are typical of what builders have incurred in different parts of the country. The thermal performance figures and comments are included. (LEW)

18366 **(SERI/TP—721-1138) Low-cost passive solar-retrofit options for mobile homes.** Brant, S.; Holtz, M.; Tasker, M. (Solar Energy Research Inst., Golden, CO (USA)). Mar 1981. Contract AC02-77CH00178. 7p. (CONF-810509—22). NTIS, PC A02/MF A01.

From Annual conference of the International Solar Energy Society; Philadelphia, PA, USA (26 May 1981).

Passive solar heating and cooling retrofit options can significantly reduce the energy consumption of new and existing mobile homes. The initial efforts of the Solar Energy Research Institute to explore the solar potential for the existing stock of mobile homes and those in the production stage are described.

18367 **(SERI/TP—721-1140) Performance evaluation of a refrigerant-charged thermosyphon solar DHW system.** Farrington, R.; DeAngelis, M.; Morrison, L.; Dougherty, D. (Solar Energy Research Inst., Golden, CO (USA)). Apr 1981. Contract AC02-77CH00178. 7p. (CONF-810509—21). NTIS, PC A02/MF A01.

From Annual conference of the International Solar Energy Society; Philadelphia, PA, USA (26 May 1981).

Refrigerant-charged passive solar domestic hot water (SDHW) systems, which have recently become commercially available, are generating great interest in the solar community. These systems, which can be installed even in freezing climates, may achieve the high performance and reliability of direct thermosyphon systems. The Solar Energy Research Institute (SERI) is testing and analyzing a promixing prototype refrigerant-charged thermosyphon system; SERI also plans to evaluate a commercially available system. The prototype was installed in a single-family residence using a stabilized R-11 as the heat transfer fluid. A system analysis was performed based on measured data. The analysis method and preliminary results, which indicate that there is reason to be optimistic about this type of system are discussed.

18368 **(SERI/TP—721-1158) Performance of a selective-surface trombe wall in a small commercial building.** Judkoff, R.; Sokol, F. (Solar Energy Research Inst., Golden, CO (USA)). Mar 1981. Contract AC02-77CH00178. 7p. (CONF-810509—23). NTIS, PC A02/MF A01.

From Annual conference of the International Solar Energy Society; Philadelphia, PA, USA (26 May 1981).

The design and construction of a 100% passive solar building utilizing a clerestory and a trombe wall are described. The use of three selectively absorptive and emissive coverings on the trombe wall outer surface are investigated. One of the coverings and its laminating adhesive are tested for degradation after a year of exposure under normal operating conditions. Ambient temperature, room air temperature, trombe wall interior and exterior surface temperatures, and solar radiation are measured.

18369 **(SERI/TP—721-1167) Moving energy-conserving design into the mainstream of the US buildings industry.** Baccei, B.C. (Solar Energy Research Inst., Golden, CO (USA)). Apr 1981. Contract AC02-77CH00178. 12p. (CONF-810423—5). NTIS, PC A02/MF A01.

From 1. International Energy Agency (IEA) conference on new energy conservation technologies and their commercialization; Berlin, F.R. Germany (6 Apr 1981).

Two programs discussed that are greatly accelerating the rate at which the US buildings industry is moving towards mass production of energy conserving solar buildings are: the Passive Solar Manufactured Buildings Program and the Solar Home Builders Program in the Denver metropolitan area. These programs provide a useful model for other efforts in accelerating private industry's rate of change. The concepts discussed on which this model is based include: industry participation in planning; incremental change; builders and architects; technical assistance (not money); large volume builders; competitive selection; simplified contractual procedures; public exposure; sensitive, concerned management. Progress of the programs are discussed. (MCW)

18370 **(SERI/TP—722-1162) Educating the design professional: energy-conscious design for commercial buildings.** Carlisle, N.; Franta, G. (Solar Energy Research Inst., Golden, CO (USA)). Apr 1981. Contract AC02-77CH00178. 5p. (CONF-810509—15). NTIS, PC A02/MF A01.

From Annual conference of the International Solar Energy Society; Philadelphia, PA, USA (26 May 1981).

The energy problem in a residence is substantially different from that in a commercial building; therefore, the approach to using renewable resources in a commercial building differs from that in a residence. For this reason, educational materials, seminars, and workshops developed to teach architects and engineers basic design principles to integrate renewable energy into commercial buildings must differ from that developed for residential building designers. The purpose of this paper is to identify some of the differences in approach between residential and commercial solar design, discuss what the Solar Energy Research Institute (SERI) Commercial Buildings Group has learned about educating commercial building design professionals through experience, and describe the American Institute of Architects (AIA) national effort to educate architects about energy-conscious design.

18371 **(SERI/TP—722-1165) Ground-coupling techniques for cooling in desert regions.** Bircher, T.L. (Solar Energy Research Inst., Golden, CO (USA)). Apr 1981. Contract AC02-77CH00178. 7p. (CONF-810509—19). NTIS, PC A02/MF A01.

From Annual conference of the International Solar Energy Society; Philadelphia, PA, USA (26 May 1981).

Results compiled from a parametric study of several variables that effect ground-coupling techniques for buildings in hot, arid regions are discussed. Finite difference models were devised and analyzed by the computer program SPICE to quantify these effects. Earlier results showed that berming or burying a structure to a depth of 3.6 m and insulating only the roof plane reduce the cooling load by 40% and virtually eliminate the heating load compared to a well-insulated building on the surface. Soil isotherm contours and heat flux results from surface and earth-integrated buildings are presented to further compare their thermal behavior.

18372 **(SERI/TR—721-907) Trade-off between collector area, storage volume, and building conservation in annual-storage solar-heating systems.** Sillman, S. (Solar Energy Research Inst., Golden, CO (USA)). Apr 1981. Contract AC02-77CH00178. 7p. (CONF-810509—24). NTIS, PC A02/MF A01.

From Annual conference of the International Solar Energy Society; Philadelphia, PA, USA (26 May 1981).

Annual storage is used with active solar heating systems to permit storage of summertime solar heat for winter use. The results of a comprehensive computer simulation study of the performance of active solar heating systems with long-term hot water storage are presented. A unique feature of this study is the investigation of systems used to supply backup heat to passive solar and energy-conserving buildings, as well as to meet standard heating and hot water loads. Findings show that system output increases linearly as storage volume increases, up to the point where the storage tank is large enough to store all heat collected in summer. This point, the point of unconstrained operation, is the likely economic optimum. Unlike diurnal storage systems, annual storage systems show only slightly diminished efficiency as system size increases. Annual storage systems providing nearly 100% solar space heat may cost the same or less per unit heat delivered as a 50% diurnal solar system. Also in contrast to diurnal systems, annual storage systems perform efficiently in meeting the load of a passive or energy-efficient building.

18373 (SOLAR/0005—81/36, pp 20p, Paper 1) **Comparative results of domestic hot water systems in the National Solar Data Network.** Kelly, C.J. Jr. (Vitro Laboratories Division, Silver Spring, MD). 1980. NTIS PC A06/MF A01.

In National Solar Data Program performance results.

The National Solar Data Network (NSDN) is a complex of remotely sensed building heating, cooling and hot water solar applications. Some results of the analysis of hot water applications in the network are presented. Issues as to performance, and reliability of the systems monitored are discussed briefly. Issues of interest to current or future monitors of similar applications are presented in more detail.

18374 **(SOLAR/1046—80/14) Solar energy system performance evaluation, Living Systems, Davis, California, October 1979-February 1980.** Spears, J.W. (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). 1980. Contract AC01-79CS30027. 78p. NTIS, PC A05/MF A01.

The Living Systems site is a single-family residence in Davis, California. The solar energy system is designed to supply 88% of the space heating. It is equipped with 273 ft^2 of south-facing double glazing for passive direct gain, 3343 gallons of water storage in site-built containers and six-inch concrete slab, and a 35,000 Btu gas furnace and a 30,000 Btu wood stove for auxiliary heating. The systems actually provided 80% of the space heat.

18375 (SOLAR/1056—80/14(Rev.)) Solar energy system performance evaluation, M.F. Smith, Jamestown, Rhode Island, October 1979-April 1980. Ashman, E.N. (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). 1980. Contract AC01-79CS30027. 92p. NTIS, PC A05/MF A01.

M.F. Smith is a single-family residence containing 2240 square feet of conditioned space in Jamestown, Rhode Island. The active solar energy system has been operating since July 1978 and is designed to supply 78% of the space heating requirements and 51% of the hot water. The gross collector array is 512 ft^2. The cover of the collector is made of a double-glazing, light weight durable translucent fiberglass material, bonded to support aluminum I-beam guide core. Water is the transfer medium of the collector. Heat from the collector is stored in a standing 3150-gallon concrete tank located in the basement of the house. Heat is distributed to the living area by a water-to-air heat pump with a heating capacity of 33,000 Btu/hr. The heat pump draws heat from the water and heats air which is blown throughout the house by means of a duct system. The systems actually produced 78% of the space heating requirements and 73% of the hot water.

18376 (TAC-STHC—80-004) Solar thermal heating and cooling: a bibliography with abstracts. Quarterly report, October-December 1980. (New Mexico Univ., Albuquerque (USA). Technology Application Center). Feb 1981. 242p. Univ. of New Mexico, Albuquerque.

This bibliography with abstracts covers the following topics: (1) demonstration; (2) system overviews; (3) computer calculations, designs, models, and simulations; (4) thermal storage; (5) architectural considerations; (6) passive solar energy; (7) air conditioning and cooling; (8) domestic water heating; (9) control systems; (10) insolation, instruments, and monitoring systems; (11) swimming pools; and (12) greenhouses. Included are an author index and keyword index. (LEW)

18377 Simple procedure for assessing thermal comfort in passive solar heated buildings. Wray, W.O. (Los Alamos Sci Lab, NM). *Solar Energy ;* **25**: No. 4, 327-333(1980).

The P.O. Fanger thermal comfort equation is linearized and used to develop a procedure for assessing thermal comfort levels in passive solar heated buildings. In order to relate comfort levels in nonuniform environments to uniform conditions, a new thermal index called the "equivalent uniform temperature" is introduced. 5 refs.

18378 Solar gasification of coal, activated carbon, coke and coal and biomass mixture. Gregg, D.W.; Taylor, R.W.; Campbell, J.H.; Taylor, J.R.; Cotton, A. (Lawrence Livermore Lab, Calif). *Solar Energy ;* **25**: No. 4, 353-364(1980).

Subbituminous coal, activated carbon, coke and a mixture of coal and biomass were gasified using direct solar irradiation in a 23-kW solar furnace located at the U.S. Army White Sands Missile Range, White Sands, New Mexico. The sunlight was focused directly on the coal (or alternate fuel) bed being gasified through a window in the reactor. Steam or CO_2 (in different experiments) was passed through the solar-heated coal bed where it reacted with the coal and thus formed a combustible product gas that contained the energy content of both the coal and the sunlight. More than 40 percent of the sunlight arriving at the focus external to the reactor was chemically stored as fuel value in the product gas. 5 refs.

18379 Membrane stratified solar ponds. Hull, J.R. (US DOE, Ames, Iowa). *Solar Energy ;* **25**: No. 4, 317-325(1980).

Several suitable liquids and membrane materials are discussed. Conditions for suppression of convection are described, and transmission of solar radiation through the pond is discussed for each of the three membrane configurations. The steady state thermal efficiency is calculated for the horizontal sheet configuration. Thermal behavior is similar to that of salt gradient solar ponds, but much deeper heat storage layers are feasible. in some cases aquaculture farming may be suitable in the storage layer. 20 refs.

18380 Analysis of solar domestic hot water heaters. Buckles, W.E.; Klein, S.A. (Univ. of Wisconsin, Madison). *Solar Energy ;* **25**: No. 5, 417-424(1980).

The performance of several generic types of solar domestic water heating systems is compared using a simulation approach. Types of systems studied included those using single and double tanks and those using direct and indirect methods of transferring solar heat to potable water. The effects of collector area, tank size, tank insulation, tempering valves and load distribution are studied. A modification to the f-chart design method is developed. This modification allows variation in tank insulation to be considered in the design method. Simulation results are compared, on a quantitative basis, with performance predictions generated by the f-chart design method modified in this manner. 7 refs.

18381 On-farm applications of solar energy. Butler, J.L. (SEA Southern Agricultural Energy Center, Tifton, GA). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 11-15(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The solar energy used by photosynthesis must be supplemented with additional energy in order to maintain a highly productive agriculture. Petroleum energy, which supplies most of the energy for production agriculture appears to be nearing depletion. Approximately half of the energy requirement is for stationary uses, such as environmental temperature and humidity control, crop drying, water heating, and irrigation. Energy for all these, especially the first three may be supplied by solar energy. Much of the technology is available to make the applications now, but economic feasibility may depend upon additional increase in the cost of fossil fuel energy. In most areas, additional research is needed to reduce the gap between present system costs and economic feasibility, especially for those uses which are highly seasonal in nature.

18382 Off-farm applications of solar energy in agriculture. Berry, R.E. (Dept. of Agriculture, Winter Haven, FL). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 16-23(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Food processing applications make up almost all present off-farm studies of solar energy in agriculture. Research, development and demonstration projects on solar food processing have shown significant progress over the past 3 years. Projects have included computer simulation and mathematical models, hardware and process development for removing moisture from horticultural or animal products, integration of energy conservation with solar energy augmentation in conventional processes, and commercial scale demonstrations. The demonstration projects include solar heated air for drying prunes and raisins, soy beans and onions/garlic; and solar generated steam for orange juice pasteurization. Several new and planned projects hold considerable promise for commerical exploitation in future food processes.

18383 Possible uses of solar energy in European agriculture. Di Vecchia, A.; Rosselli, V.; Formisano, G.; Ruggi, D. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 24-28(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The results of a study performed for the European Economic Community with the aim of identifying Solar Energy (SE) systems applicable to agriculture in the EEC and of estimating the size of their potential market are presented. The first part is a state-of-the-art survey of SE systems for agricultural applications. The second part is the presentation and analysis of data relative to energy consumption. The third part uses a double-pronged methodology to identify for each agricultural application those SE techniques which could become competitive: the one line of reasoning analyzes the obstacles hindering the penetration of solar techniques; the second derives a numerical estimate of the solar collector surface that would be necessary to cover any given percentage of the thermal load of each sector in each region. Finally, the two routes are assembled into an overall evaluation of the possibility of introducing a given technology in a given sector in the EEC.

18384 Methods of drying grain with solar energy. Foster, G.H.; Baker, K.D.; Peart, R.M. (Purdue Univ., Lafayette, IN). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 29-33(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Research on solar grain drying has been directed toward finding the best and most cost-effective methods of applying solar energy as a source of heat for drying. Solar assisted low temperature drying systems successfully dried full bins of corn when the initial corn moisture was limited to 20 to 22 percent. Corn with initial moisture contents up to 30 percent was successfully dried when shallower layers of grain were placed in the bin periodically after the moisture content of the previous layer had dried to 20 percent or below.

18385 **Comparative performance and economics of solar drying of wheat in Canadian prairies.** Catania, P. (Univ. of Regina, Saskatchewan); Davidson, H.; Kwon, Y.; Wrubleski, M. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 34-38(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Preliminary experimental results are presented for three solar air grain dryers which can be constructed by a farmer at on-the-farm site locations. These solar grain dryers can be constructed on round or rectangular bins or on the southern exposure of existing on-the-farm structures. The present discounted costs for four solar air grain dryer designs are less than the present value associated with the selling of wet-damp wheat at terminal sites.

18386 **Solar IPH in Mid-America: a MASEC study.** Murray, O.L. (Industrial Solar Associates, Florissant, MO). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 39-43(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A recently completed study addressing the technical feasibility of solar energy in industrial process heat (IPH) applications in Mid-America is discussed. The effort was contracted by the Mid-American Solar Energy Center (MASEC) to Industrial Solar Associates. The study was one of two contracted efforts of the same objective covering the MESAC 12-state region. The results of the study are encouraging to the potential future role of solar energy in supplying process heat to a varied range of industries and applications in the central U.S. Case Study documentation of twenty (20) feasible solar IPH applications covering eight (8) major SIC groups within the Mid-American region, ranging in estimated installed cost from $31.25 to $46.00 per square foot of collector area was developed.

18387 **Passive solar heating system for commercial greenhouses.** Albright, L.D. (Cornell Univ., Ithaca, NY). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 54-58(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The physical, thermal, biological and economic considerations which arise in designing a passive solar heating system for commercial greenhouses are reviewed. The central features of a system developed at Cornell University are described. The Cornell system is based on a multilayer night blanket which reduces night heating needs 80 percent. Sliding night temperatures, augmented thermal mass, and proper control of the night blanket complete the system.

18388 **Rutgers system for solar heating of commercial greenhouses.** Mears, D.R.; Kendall, P.W.; Roberts, W.J.; Cipolletti, J.P.; Simpkins, J.C.; Janes, H.W. (Rutgers-the State Univ., New Brunswick, NJ). Contract EG-77-C-05-5454. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 59-63(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Research on solar heating of greenhouses has focused on the development of low initial-cost systems utilizing materials and construction techniques currently available in the greenhouse industry. The system is based upon a flooded subfloor storage which is unobtrusive and enables the entire floor to serve as the primary heat exchange area. With a massive storage and large heat exchange capacity the solar system can operate effectively at relatively low temperatures enabling low-cost plastic film solar collectors to be effectively utilized. Also, warming the floor of a greenhouse has been found to have a beneficial effect on the plants and allows air temperatures to be significantly reduced for many important crops. Movable curtain insulation systems are used to reduce nighttime heat loss. A number of research greenhouses have been tested over the past 5 years and a 0.54 hectare commercial demonstration is in its third year of operation.

18389 **Solar greenhouse workshop; video documentary.** Austin, B. (Wright State Univ., Dayton, OH); Devine B.; Taylor, C. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 64-66(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A 38 minute video-tape documentary of the building of an attached solar greenhouse is presented. The tape follows the construction process from foundation preparation to greenhouse completion. The tape allows greater outreach to potential builders of solar greenhouses than a conventional construction workshop. It allows viewers to appreciate the simplicity of construction, and encourages, by example, interested people to start building. The process of making the documentary is briefly described, as are its potential uses. Copies of the video-tape are available, for the cost of the tape alone, from Antioch Video, Antioch College, Yellow Springs, Ohio 45387.

18390 **Solar pond-assisted heat pump heating system for commercial greenhouses.** Shah, S.A.; Short, T.H.; Fynn, R.P. (Ohio Agricultural Research and Development Center, Wooster). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 67-71(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A solar pond for annual cycle solar energy collection and storage was studied at the Ohio Agricultural Research and Development Center (OARDC), Wooster. It had been used as a thermal energy source for greenhouse heating. A brine-source electric-power-driven heat pump was incorporated into the heat extraction system. Initial results of the field studies indicated that the combined system improved the effectiveness of both the heat pump and the solar pond by enabling a larger temperature cycle within the solar pond. To study the operation of such a system, a computer simulation model for the heating system was developed. The results of simulations were used to establish a relationship between the system performance and the present design and for sizing the solar energy collection and storage system. Also, the effect of an experimental polystyrene pellet nighttime insulation for the greenhouse was simulated. Increasing the surface area of the OARDC pond was found to be less effective than changing its depth. The results showed that a 5 m deep pond with a 1.0 m gradient zone significantly improved the overall performance of the system when used as a heat source for a heat pump. Based on the detailed experimental and computer simulation performance analysis, the solar pond-assisted heat pump system has the potential of improved performance compared with conventional air source heat pumps.

18391 **Recent progress in thermochemical water splitting.** Besenbruch, G.E.; Chiger, H.D.; McCorkie, K.H. (General Atomic Co., San Diego, CA). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 144-145(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

18392 **Rating procedure for solar domestic hot water systems.** Chandra, S.; Khattar, M.K. (Florida Solar Energy Center, Cape Canaveral). Contract AC01-79CS30127. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 167-171(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A simple test and rating procedure for solar domestic hot water (SDHW) systems is proposed as a comparison shopping tool for SDHW consumers. The proposed procedure consists of testing a baseline and a test SDHW system side by side on a single reasonably sunny day with hot water drawn off from both systems. The ratio of the daily solar fractions of the test and baseline systems expressed as a percentage is called the daily Relative Solar Rating RSR/sub d/. Through TRNSYS computer simulations of a wide variety of SDHW systems, it is shown that the RSR/sub d/ of a system is uniquely related to the annual RSR of the system for a

given location. It is further shown that the RSR/sub d/ is a constant and nearly independent of insolation and temperature of the test day. The proposed test and rating procedures are presented and the feasibility of the concept demonstrated by TRNSYS.

18393 Performance testing of solar DHW systems - a laboratory viewpoint. Youngblood, W.W.; Swanson, W.L. (Wyle Labs., Huntsville, AL). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 172-176(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Various procedures and procedural options are discussed relative to the performance testing of packaged solar domestic hot water (DHW) systems for residential application. Considering the relative merits of using natural or simulated solar radiation, the advantages of testing indoors using simulated solar inputs are shown to be compelling. Performance tests are discussed of those DHW systems which may be performed relatively quickly (4 days or less) are simple to perform and interpret, and are repeatable. The questions which are discussed include: 1) what constitutes an adequate DHW system performance test; 2) what boundary conditions must be established; and 3) can the results be interpreted in a meaningful way. In short, what criteria should be set which will ensure that the test procedure is not only accommodating (to a variety of solar DHW systems), but is fair to each system.

18394 Thermal and economic comparison of two-tank system recirculation versus non-recirculation characteristics. Choi, M.K.; Morehouse, J.H. (Science Applications, Inc., McLean, VA). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 177-181(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A solar hot water system is to be employed in the SAI/Prudential 15-story office building in Northern Virginia. The comparative thermal and economic performance of this system using two different design concepts is presented. The primary concern is the effect of recirculating the hot water between the storage tank and the hot water tank during off-load hours when the storage tank can heat the hot water to above th minimum delivered temperature. The simulation results indicate that recirculation only slightly improves the thermal performance by increasing the gross solar fraction by 2.7% and the net solar fraction by 1.1%. Recirculation deduces the life-cycle cost by an insignificant amount of $210.

18395 Double water chimneys as optimum thermal diode designs for the interconnection of a solar DHW storage tank and a gas fired backup tank. de Winter, F. (Altas Corp., Santa Cruz, CA). Contract EM-78-C-02-4696. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 182-185(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A double chimney device has been developed which acts as an effective thermal diode between a solar domestic hot water (DHW) tank and a backup heater mounted on top. The chimney has a high conductance of heat for upflow, and a negligibly small one for downflow. A simple equation has been developed to describe the performance. Tests confirmed the equation to within about 10 to 20%, and showed that under typical conditions the backup tank under solar heating conditions was only about 1°C colder than the solar tank, an improvement of about a factor of 7 over the case with no diode. TRNSYS simulations with modestly sized DHW systems with such a diode, using an identical DHW consumption day in day out, showed that contribution of good diode performance to the solar fraction was essentially zero. This goes against intuition, and it can probably be attributed to the fact that a modestly sized DHW system coupled to a constant DHW load never uses the diodes. It appears that simulation work should begin to consider day to day variations in DHW consumption.

18396 Transient effects on the performance of a residential solar absorption chiller. Guertin, J.M.; Wood, B.D. (Arizona State Univ., Tempe). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 186-190(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The transient performance of a commercial residential 3 ton lithium-bromide/water absorption chiller is studied. Emphasis was placed on separating the chiller response from that of the entire test facility so that its transient response could solely be observed and quantified. It was found that the entire system time response and thermal capacitance has a major impact on performance degradation due to transient operation. Isolation of the absorption chiller from system effects showed time to steady state performance to be a linear function of steady state water supply temperatures. These findings summarized in computer algorithms were used to map the integrated performance of a 3 ton absorption chiller.

18397 Variations on control systems for an absorption chiller. McChesney, R.M. (Heart Federal Savings and Loan Association, Auburn, CA); Howe, E.D. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 191-195(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The cooling of a 1,000 sq. meter financial building has been accomplished using solar energy to drive a 25-ton Arkla absorption type water chiller. The problem discussed is that of controlling the back-up gas water heater to minimize the gas used. Three control systems were used for comparison which are: No. 1 system based on the temperature of the hot water driving the Arkla; No. 2 system - the chilled water leaving the unit and No. 3 system - the temperature difference between the ambient and the hot water reaching the Arkla machine. The latter scheme proved to be the most economical.

18398 Five solar cooling projects. Davis, R.E.; Williamson, J.S. (Solar Energy Research Inst., Golden, CO). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 196-199(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The jointly funded $100 million five-year international agreement (SOLERAS) between Saudi Arabia and the United States was undertaken to promote the development of solar energy technologies of interest to both nations. Five engineering field tests of active solar cooling systems funded under the SOLERAS agreement for installation and operation in the U.S. southwest are described.

18399 Thermodynamic analysis of a combined cycle solar absorption heat pump system. Russell, L.D. (Mississippi State Univ., MS). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 200-204(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A thermodynamic cycle is analyzed which utilizes the absorption process with energy recovery from the condenser to produce a refrigeration system with an improved coefficient of performance. Analytical results presented include calculations of coefficient-of-performance as a function of generator temperatures for both heating and cooling cycles with parametric results for different ratios of input solar thermal energy to input electrical energy. Analysis is also presented which leads to an expression for the optimum generator temperature for the ideal cycle when the input solar energy is supplied by a flat plate collector. Practical application of the cycle is discussed.

18400 Open-cycle absorption cooling using packed-bed absorbent reconcentration. Leboeuf, C.M. (Solar Energy Research Inst., Golden, CO); Loef, G.O.G. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 205-209(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The technical feasibility of a lithium chloride open-cycle absorption air conditioner using solar-heated air for reconcentration of the absorbent solution is examined. In contrast to a successfully operating Soviet design (in which absorbent reconcentration is accomplished by trickling the solution across a sloping black roof exposed to the sun), this study involves a packed-bed concentrator. Solar-heated air reconcentrates the solution by vaporizing water (the refrigerant) from the solution in the packed bed, enabling the system to be incorporated into a conventional solar air-heating system and avoiding numerous problems associated with the roof

concentrator. A thermodynamic analysis provides the criteria for the design of the packed bed. Heat and mass transfer processes occurring simultaneously in the bed are modeled using an iterative technique with the aid of a digital computer. The size of the packed-bed required to reconcentrate the absorbent solution at a rate corresponding to 10,550 W of cooling is determined, using flow rates, temperatures, and humidities typical of residential solar air-heating systems. Based on these results, the system air conditioning capability with solar energy input is predicted over the course of a clear summer day for Fort Collins, Colorado, and St. Louis, Missouri. Sufficient cooling capacity to meet a 10,550 W peak load using a 70 m^2 flat-plate collector array is predicted by the model for both locations.

18401 **Solar cooling via capor compression cycles.** Lior, N.; Yeh, H.; Zinnes, I. (Univ. of Pennsylvania, Philadelphia). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 210-214(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A review of vapor compression cooling systems which are driven by solar energy power cycles is provided. A novel hybrid solar-powered fuel-superheated steam Rankine cycle, which utilizes solar heat to vaporize water at relatively low temperature (100°C) and superheats the steam by a fuel-fired superheater to 600°C is described. This cycle has an efficiency double that of organic fluid Rankine cycles used for solar cooling, and operates at a lower temperature, at the expense of an approximately 25% fossil energy input. The resulting major reduction in the required collector area (and quality) improves system economics markedly. A 30 HP, 75% efficient steam turbine was designed for this cycle. For solar powered cooling, COP's based on (cooling energy)/ and $ (cooling energy)/(depletable resource-energy input) are recommended, at standardized test conditions.

18402 **Comparison of the performance of open cycle air conditioners utilizing rotary desiccant dehumidifiers.** Jurinak, J.J.; Beckman, W.A. (Univ. of Wisconsin, Madison). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 215-219(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The results of an investigation of open cycle cooling systems using rotary desiccant dehumidifiers are presented. Three systems, the ventilation, recirculation, and Dunkle cycles have been modeled. The performance of these systems coupled with an air-based solar system has been determinded using TRNSYS simulations of system operation in four representative U.S. climates. The system COP, fraction of the total cooling load met by the desiccant system, and fraction of the thermal energy provided by solar energy are compared. An assessment of the effect of climate and system parameters on the relative performance of the three system configurations is made. It is shown that in order to meet residential loads of 7-11 kW with a COP on the order of unity, systems with high effectiveness must be employed. These systems were also found to perform well when operated solely with a solar thermal imput.

18403 **Cross-cooled desiccant dehumidifier for solar powered cooling systems.** Worek, W.M.; Lavan, Z. (Illinois Inst. of Technology, Chicago). Contract EG-77-C-03-1584. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 224-227(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A 0.6 m x 0.6 m x 0.6 m cross-cooled desiccant dehumidifier prototype using silica gel sheets has been manufactured and extensively tested over a wide range of operating conditions. The prototype has a high COP with a low pressure drop and requires low regeneration temperatures.

18404 **Feasibility study of using a Vuilleumier device for solar cooling.** Rule, T.T.; Wood, B.D. (Arizona State Univ., Tempe). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 228-232(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A simplified mathematical model of a Vuilleumier refrigerator is derived, resulting in a system of four nondimensionalized differential equations. The model considers thermal losses due to a finite heat transfer coefficient between the working fluid and the wall, and to regenerator effectiveness less than unity. Numerical solutions are obtained for operating temperatures that would apply to solar powered space cooling applications. The results show that the coefficient of performance of the Vuilleumier refrigerator is slightly below that of a lithium-bromide/water absorption refrigerator for source temperatures below 100C (212F). At higher source temperatures, the performance of the Vuilleumier refrigerator increases significantly.

18405 **Improving performance of solar heating and cooling systems.** Oberoi, H.S.; Ward, D.S.; Westhoff, M.A. (Colorado State Univ., Fort Collins). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 233-237(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

During the portion of the heating season extending from Nov. 1979 though Feb. 1980, Colorado State University Solar House III has used a solar system that includes 53.3 m^2 of single cover selective surface flat-plate solar collectors and a 4600 liter thermal storage tank with auxiliary heat supplied by an air-to-air heat pump and electric resistance heat. The optimization of the piping system has led to significant reductions in parasitic power used in collection and supply. Performance results are presented and compared with predictions calculated from three different design methods. Due to the brevity of the study period, definitive judgements of the accuracy of these design methods cannot be made. However, discrepancies between actual and predicted performance can be explained to a certain extent by recognizing violations of basic assumptions used in formulating the various methods.

18406 **Operating performance evaluation of solar heating and cooling systems.** Ward, J.C.; Ward, D.S. (Colorado State Univ., Fort Collins). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 238-242(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Starting with the equations for solar collector performance, an equation for collectible solar radiation is presented. Taking into account small efficiency reductions due to series installation of solar collectors and the corresponding interconnection heat loss, equations common to both solar heating and cooling systems are presented for evaluation of: the solar system thermal efficiency, fraction of the building heating or cooling load furnished by solar energy, the energy saved by using solar energy for heating and/or cooling, the solar system conventional energy coefficient of performance, and the over-all solar system efficiency. It is shown that these quantities for solar heating are at least double that for solar cooling. It is also shown that solar system heat losses to the building interior are devastating in the case of solar cooling.

18407 **Residential application of the Rutgers system for solar heating of greenhouses.** Mears, D.R. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 247-250(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

An important feature of the Rutgers system for solar heating of greenhouses is a flooded subfloor which serves as a massive storage and enables the entire floor surface to act as the primary heat exchanger. Preliminary studies indicate that adapting this concept to a residential space heating system would enable the solar system to operate at low temperatures, about 25 to 30°C facilitating the use of simple and low-cost solar collection systems. A 125-year old residence is being retrofit with a 2-story addition with a flooded subfloor and a lean-to style greenhouse also with a flooded subfloor storage. A wooded stove with a water heating coil supplements the solar system and the pre-existing residential heating system is the final backup. Since the system became partially operational in early February, all space heating needs have been met by passive gain from the greenhouse and the wood stove.

18408 First year performance monitoring of an urban row house retrofitted to solar heating. Lior, N. (Univ. of Pennsylvania, Philadelphaia). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 261-265(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A Philadelphia row home, which was retrofitted to solar heating, has been in operation for more than a year. The system was temporarily shut down for inspection, calibration and minor modifications, and the conclusions are presented. The house is operational again. The computerized data reduction method is described. Calibration results show temperature drifts of the RTD's typically below 0.6°C over 2 years, and small acceptable drifts for other instruments. The solar heating system performed reliably, except for some moderate corrosion problems in the thermal storage tanks. Most of the instruments were reliable, and those which weren't are described. Recommendations to remedy the difficulties incurred are offered.

18409 Solar heating system design by the method of efficiencies. Carpenter, S.C. (Watershed Energy Systems Ltd., Toronto, Ontario); Hollands, K.G.T. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 266-270(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A new short-cut method for designing liquid or air-based short-term storage building heating and service hot water systems is described. The equations for the method were derived from an analysis of a model for the system, rather than on a correlation of the results of detailed computer simulations. Based on an analytical integration over an entire year, it uses yearly data as input, thereby eliminating the need to sum over the months. Also eliminated is the need to the immediate user to calculate irradiation on sloped surfaces, since the yearly figures can be readily tabulated for various slope angles. When compared to an hourly simulation program, WATSUN, the method appears to give comparable accuracy to f-chart in locations which are not heavily overcast, and improved accuracy in overcast locations.

18410 Method for generating graphic solar design tools. Wright, W.A. (Northeast Solar Energy Center, Boston, MA). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 286-290(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A method for generating multiple parameter, parallel entry graphic solar design tools by the exercise of correlation derived algorithms is described. The design charts are obtained by parametric variation around a base case for a specific system type. Contours of constant annual productivity are presented and functions of key design parameters; a serial correction factor multiplication is used to obtain the modified productivity. Error relative to the parent algorithm is plotted on the design charts. An example of application of the method to Solar Domestic Hot Water, SOLGRAF/DHW is presented and a sample problem worked for the Northeast.

18411 Performance characteristics and selection considerations for air-to-water finned-tube coils for solar energy systems. Gilman, S.F.; Maust, J.D. (Pennsylvania State Univ., University Park). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 296-299(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The concept of coil effectiveness is described and its inability to define an actual hot water coil is pointed out. Typical manufacturers' coil data are analyzed and variables that influence coil effectiveness are brought out. The many design decisions that have to be made to actually select a direct space heating coil are discussed and a potential procedure for residential solar energy systems is described and demonstrated.

18412 Testing of the DOE-2 solar simulator. Freeman, T.; Morrison, D. (Altas Corp., Santa Cruz, CA). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 304-308(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The Component Based Simulator (CBS) is a package of routines developed at Los Alamos Scientific Laboratory (LASL) to provide the DOE-2 building energy analysis program, developed principally at Lawrence Berkeley Laboratoty (LBL), with the capability of simulating active solar heating and cooling systems. The package is conceptually and functionally based on the TRNSYS simulation code but has been designed to execute much faster, to be compatible with a wide variety of commercial and residential HVAC systems as represented by DOE-2, and to provide a simple user interface. The building LOADS, HVAC SYSTEMS, and non-solar PLANT portions of the DOE-2 program have undergone extensive checking in several testing programs but CBS results had previously been spot checked for only a few cases. These spot checks included software-software comparisons with other solar simulation codes for a few typical solar space and industrial process heat applications and a software-hardware comparison with a well instrumented commercial building. In the new work, a systematic testing program has been conducted to perform broad parametric analyses of the code throughout the range of its applicability. The purpose was to seek out basic modeling and programming errors, to assess the compatibility of the solar system models with the HVAC system configurations in SYSTEMS and the mechanical heating and cooling equipment in PLANT, to test the capability of the code to identify and protect the user against various forms of input error, and to identify any misrepresentations, ambiguities, or missing information in the documentation.

18413 Design procedure for solar-assisted series heat pump storage. Svard, C.D.; Mitchell, J.W. (Univ. of Wisconsin, Madison). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 314-318(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A procedure for calculating the thermal performance of solar-assisted series heat pump systems for space heating has been developed. The method can account for energy delivered to the load in the heat pump only, solar only, and combined solar-heat pump heating modes. The procedure accounts for the variable efficiency of energy delivery by the heat pump. The fraction of energy supplied by solar and the fraction supplied by work and auxiliary are determined. The performance results from this design procedure were tested against detailed simulations on a monthly and seasonal basis. The results agreed within 3% on a seasonal basis and within 12% on a monthly basis.

18414 Performance evaluation of a solar house utilizing a high temperature heat pump. Eltimsahy, A.H.; Barnes, R.L.; Molyet, R.G.; Jones, M.L. (Univ. of Toledo, OH). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 319-323(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The design and construction of a heat pump system suitable for incorporating in a space solar heating system utilizing off-peak storage from the electric utility are described. The experimental evaluation of the performance of the system is examined. The refrigerating capacity, heating capacity and compressor horsepower for a heat pump system using a piston type compressor are first determined. The heat pump design is also matched with the existing University of Toledo solar house heating system. The refrigerant is Freon-12 working between a condensing temperature of up to 172 F and evaporator temperature between 0 F and 75 F. The heat pump is then installed. Performance indices for the heat pump and the heating system in general are defined and generated by the on-line computer monitoring system for the 1979/80 heating season operation. Monthly and seasonal indices such as heat pump coefficient of performance, collector efficiency, percent of heating load supplied by solar energy and individual components efficiencies in general are recorded. The data collected is then analyzed and compared with previously collected data. The improvement in the performance resulting from the addition of a piston type compressor with an external motor belt drive is then evaluated. During the 1977/78 and the 1978/79 heating seasons the system was operated without the heat pump.

18415 Sensivity analysis of solar assisted heat pump systems. White, N.M. (Science Applications, Inc., McLean, VA); Swanson, T.D.; Morehouse, J.H. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 324-328(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Space heating systems which combine the use of solar energy with an electrical heat pump have been proposed as a practical approach to the cost effective utilization of solar energy. Through utilization of previously developed thermal and economic models, areas for possible cost reduction and/or performance improvement in SAHP systems are identified. Major system components evaluated include collectors, heat pump, storage heat exchangers, and controls. Variations in many of the parametric values of each of these components are evaluated. This study identifies the heat pump and solar collectors as the components with the greatest potential for technical improvement. For the heat pump, its capacity at design point, and rate of change in capacity with increasing evaporator temperature are the principal parameters. For the collectors, their tauα and U/sub L/ are the principal parameters. The change in system performance due to specific parametric variations is quantified. Costs associated with each change are also estimated. This permits computation of life-cycle costs for each alternative system design. The result of this work should help to identify the most optimistic, but realistic, future SAHP designs.

18416 Performance evaluation of parallel solar augmented heat pump with off-peak heat storage. Reid, R.L.; Tomlinson, J.J.; Bedinger, A.F.G.; McGraw, B.A.; Lumsdaine, E. (Univ. of Tennessee, Knoxville). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 329-333(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Experimental analysis of a parallel solar augmented heat pump (air system) with off peak heat storage has been made for a system in Knoxville, Tennessee. The overall system thermal performance factor was determined to be 1.60 for the period November 1, 1979 through February 29, 1980. It was determined that utilization of the solar system pebble bed for off-peak heat storage can substantially reduce electric energy consumption during utlity peak periods. However, further work is required on system controls and system design in order to minimize purchased energy requirements. In an adjacent facility a series solar-assisted heat pump (liquid system) without controlled off-peak heat storage has been operating for the same time period as the parallel system. The overall system performance factor was determined to be 2.33 for the series system.

18417 Comparison of chemical heat pump and conventional solar heating systems. McLinden, M.O.; Klein, S.A. (Univ. of Wisconsin, Madison). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 334-338(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A simulation model of a solar chemical heat pump system for residential space conditioning is developed. This model is used in a simulation study comparing the heating season performance of the solar chemical heat pump with that of a conventional liquid-based solar heating system. The effects of storage size, collector area and collector type are investigated for systems located in Albuquerque, NM; Columbia, MO; and Madison, WI.

18418 Experimental verified simulation of a parallel solar/off-peak/heat pump air heating system. Chaffin, D.J.; Reid, R.L. (Univ. of Tennessee, Knoxville). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 339-343(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The University of Tennessee-Tennessee Valley Authority Solar Augmented Heat Pump Test Facility is an unoccupied building containing a parallel heat pump/off-peak resistance/solar heating system. The performance of this system has been simulated using a modified version of the TRNSYS solar simulation computer program. Generally accurate results were obtained when simulation results were compared against data collected on-site for the 1979-1980 heating season. Predictive results were also obtained from the model for an entire year of weather data. Performance of the system was compared against: (1), a solar/heat pump system without off-peak resistance heat; (2), a similar system with heat pump only; and (3), a similar system with an off-peak heat pump replacing the resistance heat. The results show that the off-peak systems may not be economically feasible except at large ratios of on-peak to off-peak power rates. The two off-peak systems were also found to be very sensitive to control configuration.

18419 Thermal and economic assessment of ground-coupled storage for residential solar heat pump systems. Choi, M.K.; Morehouse, J.H.; Hughes, P.J. (Science Applications, Inc., McLean, VA). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 349-353(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

This study performed an analysis of ground-coupled stand-alone and series configured solar-assisted liquid-to-air heat pump systems for residences. The year-round thermal performance of these systems for space heating, space cooling, and water heating were determined by simulation and compared against non-ground-coupled solar heat pump systems as well as conventional heating and cooling system in three geographic locations: Washington, D.C., Fort Worth, Texas, and Madison, Wisconsin. The results indicate that a combined solar/ground-coupled heat pump system for space heating and cooling is not cost-effective. However, a ground-coupled stand-alone heat pump system using either a conventional domestic hot water system or a separate solar water heating system has significant energy savings as compared to conventional furnace systems. It also has some energy savings over conventional air-to-air heat pump systems, particularly in Washington, D.C. The cost of that saving is not beyond that which the average consumer can be expected to pay. Therefore, the ground-coupled stand-alone heat pump system is a cost-competitive system.

18420 Optimal control of solar heating systms utilizing a dual source heat pump. Molyet, R.G.; Eltimsahy, A.H.; Jones, M.L. (Univ. of Toledo, OH). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 345-358(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The mathematical model is presented and a proposed optimal control strategy is discussed for a residential solar heating system employing a dual source heat pump. The primary heat source is solar, with well water serving as the auxiliary. The model incorporates a novel method for the on-line generation of the heat pump COP which avoids resorting to the nonlinear equations of the heat pump components. A quadratic performance index is formulated which is intended to minimize the cost of collecting and distributing heat energy while maintaining a comfortable living area. The problem solution is expected to lead to a suboptimal feedback controller. Initial results which demonstrate the capability of the COP generation and the validity of the system model are presented.

18421 Large scale space heating and DHW system using shallow solar pond with heat pump assistance. Ahmed, S.F.; Scanlon, P.W. (Burt Hill Kosar Rittelmann Associates, Butler, PA). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 359-363(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A shallow Solar Pond (SSP) System assisted by a heat pump has been designed to supply both space heating and domestic water (DHW) service to a portion of a college campus in Senatobia, Mississippi. The system comprises eight (SSP) modules having a total area of 2,378 m^2 (25,600 ft.), and two high temperature heat pumps. The total savings realized from the system are about 5,820 GJ (5,520 x 10^9 Btu) per year after accounting for electricity used by the heat pumps.

18422 SOLOCOST heat pump algorithms. Hull, D.E. III. (Martin Marietta Aerospace, Denver, CO). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 359-363(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The SOLOCOST heat pump methodology has the power of hour-by-hour simulation approach, yet is simple to use and requires

minimal computer resources. Both the series and parallel heat pump systems are modeled in SOLCOST. Both algorithms use an average-day analysis which is based on a one-day per month simulation (using hourly steps). An iterative procedure is used to insure convergence of the one-day approach; i.e., the storage temperature at the end of the day is consistent with the initial storage tomperature at the start of the simulation. The maximum, minimum, and average storage temperatures are printed for each month of the simulation. Solar fractions from the new SOLCOST heat pump algorithms were compared with predictions from the hour-by-hour TRNSYS simulation for three locations. The maximum difference in the annual fractions was six percent, which is excellent.

18423 Design of a flux diverter and containment tube with results of tests at ACTF and CNRS. Gordon, B.A. (Science Applications, Inc., McLean, VA); Knasel, T.M.; Sievers, R.; Bomar, S.; Royere, C.; McDonnel, M.D. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 478-480(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Obtaining empirical data on the response of soils and changes in the overlying air due to the thermal pulse of nuclear detonations required development of special test apparatus and use of high fluxes in a large solar furnace. The development of such apparatus, based on non-imaging optic principles; the influence of solar furnace test series in which the apparatus and instrumentation have been tested for thoroughput, durability, and suitability for meeting the requirements are discussed. Tests were conducted at the Advanced Components Test Facility and the Centre National de la Recherche Scientifique 1 MW solar furnace. These tests resulted in apparatus redesign, and change in procedures and instrumentation in preparation for further testing.

18424 Central receiver solar energy system for an oil refinery. Sommerlad, R.E. (Foster Wheeler Development Corporation, Livingston, NJ); Raghavan, R.; Pichnarcik, R.A. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 568-571(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The conceptual design of a central receiver solar energy system that will provide practical and effective use of solar energy for an oil refinery currently being designed by Foster Wheeler Energy Corporation for the Provident Energy Company is discussed. The refinery will be built 25 miles southwest of Phoenix, Arizona, and is scheduled to be in operation by 1983. The system will be designed to make maximum use of existing solar thermal technology consistent with existing refinery design and operating techniques, will provide for the best possible economics for the application, and will offer the best combination of solar and fossil-fuel energy. The design is for a baseline system consisting of a tower-mounted, natural-circulation water/steam receiver with an 18.4 kg/s (146,000 lb/h) capacity. A flat-panel absorber generates saturated steam that is superheated to the desired temperature in a separate, oil-fired superheater prior to admission to the main refinery superheated steam headers. Solar energy is concentrated on the receiver by a field of heliostats north of the tower.

18425 Pratical solar performance monitoring. Fowlkes, C.W. (Fowlkes Engineering, Bozeman, MT). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 626-630(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Experience gained in developing instrumentation for monitoring the thermal performance of a dozen solar heated projects in Montana is summarized. These projects were typically privately owned, occupied residences. The monitoring period averaged two months and the funds available were in the range of $7K per project including instrumentation. The general areas addressed include (a) data requirements, (b) a low-cost data acquistion system utilizing the Radio Shack TRS-80 microcomputer, and (c) the pratical problems of instrumenting occupied homes.

18426 Solar energy system acceptance test. Joncich, D.M. (CERL-ES, Champaign, IL); Johnson, D.L. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 631-635(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A solar energy system acceptance test procedure and instrumentation package have been developed for determining the extent to which a newly installed active solar system is performing to design specifications. This short-duration test, devised to determine the acceptability of the building construction work, is sufficiently versatile to allow an evaluation of a wide variety of solar system types. An analysis of the system thermal performance is carried out automatically according to well-defined test procedures by a microprocessor-based data acquisition system. The acceptance test concept and hardware have been field tested.

18427 Low cost data acquisition and data processing system. Andes, S. (Londe-Parker-Michels, Inc., St. Louis, MO). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 636-638(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The development of a low cost ($4000) data system configured around a micro-computer is described. The system has wide application in meeting on-site data acquistion and analysis needs for even low budget projects. The heart of the system uses a Z-80 microprocessor with 32K of RAM memory available for data monitoring and analysis. Mass storage is provided on a single-drive double density disc system (180K bytes), and a 64-channel software programmable, analog-to-digital signal converter (A/D) provides communication to the real world sensors (temperature, solar insolation, on/off, etc.). Communications to the CPU takes place via the full ASCII keyboard and 16 x 64 character CRT video display. This system is now currently being used in the Michels' Residence, a passive solar retrofit demonstration project, as the primary data acquistion and analysis system.

18428 Solar-powered distillation: economic analysis. Tleimat, B.W. (Univ. of California, Berkeley). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 639-643(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A solar-powered multieffect distillation plant driven by a solar boiler with an average daily output of 45,400 kg (100,000 lb.) of saturated steam at 60 C (140 F) is optimized on the basis of minimum water cost. Using a very high performance evaporator, developed and tested at this Laboratory as the main element in the multieffect system, resulted in optimum water costs ranging from $1.40 to $3.70 per m^3 ($5.30 to $12.10 per K gallons) for brackish water feed and $2.15 to $4.70 per m^3 ($8.20 to $17.90 per k gallons) for seawater feed. At these conditions, the daily productivity per unit area of solar collectors ranged from 65 to 130 liters per m^2 (1.6 to 3.2 gallons per ft^2). This is twenty to forty times the average productivity of simple solar stills (3 liters per m^2).

18429 Design and analysis of a system using CPC collectors to collect heat and to produce industrial process steam. Hsieh, C.K. (Univ. of Florida, Gainesville); Reed, K.A.; Schertz, W.W. Contract W-31-109-ENG-38. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 654-658(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A system has been designed to use CPC (Winston) collectors to collect solar energy and to produce industrial process steam. The system is composed of two loops of collectors. In the collector loop the energy collected is used to operate a preheater. The preheated water is reheated in the boiler loop where the heated water at an elevated pressure is throttled to steam in a flash boiler. Two types of receivers are used in the system. In the collector loop concentric tube receivers are used. Heat pipe receivers are used in collectors in the boiler loop to minimize scaling problems. An attempt is made to use computer modeling to study the collector performance. A thermodynamic cycle analysis is also given to evaluate the system performance.

18430 Procedures for on-line detection of sensor and operating faults in solar energy systems. Duff, W.S.; Millard, R.A. (Colorado State Univ., Fort Collins). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 659-663(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Every 10 minutes, 100 channels of directly measured quantities, integrated and counted flows and fluxes, and calculated energy

quantities from Colorado State University Solar House I are recorded on magnetic tape and passed on to a minicomputer with dual floppy disc, printer, and plotter. The magnetic tape output is processed in monthly blocks to provide detailed monthly, daily, and hourly reduced data summaries. The minicomputer is used to display real time operating data, print out hourly performance summaries, and collect statistics on sensor and operating system status. These statistics are then analyzed to detect possible sensor and operating faults in the system so they may be quickly recognized and corrected. The procedures that have been developed to perform these analyses are discussed, and their use and effectiveness under actual operating conditions is illustrated.

18431 **Solar industrial process steam for a corrugator application.** Semmens, M.; Collaros, G.J.; Fong, A. (BDM Corp., Albuquerque, NM). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 664-666(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Industrial process heat applications have been identified as one of the most promising market areas for the application of solar energy technology. A key application for the use of solar industrial process heat (SIPH) has been identified: cardboard corrugation facilities. DOE has sponsored the design and analysis of a SIPH application at a corrugation operation in Fort Worth, Texas. The preliminary design has suggested that the DOE cost goals can be achieved in the near future with a roof-mounted solar array providing saturated process steam to the manufacturing process. In fact, the capital requirements are less for the roof-mounted (versus ground-mounted) solar system in the Fort Worth area. The corrugator application system preliminary design and analysis are described.

18432 **Intermediate temperature application of solar-generated industrial process heat.** Golay, A. (TEAM, Inc., Springfield, VA). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 672-675(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A solar energy industrial process heat system has been designed for the Hilo Coast Processing Company in Hilo, Hawaii. The system incorporates 4097 M^2 (44,100 ft^2) of single-axis tracking, parabolic trough, concentrating solar collectors that generate during peak conditions, 3196 kg, Hr^{-1} (7320 lb, Hr^{-1}) of superheated steam at a temperature and pressure of 216°C (420 F) and 1138 kPa (165 Psia). The collector field distribution system is a closed loop with a synthetic oil being used as the heat transfer media. The fluid flow rate through the field varies directly with the level of insolation so as to maintain a relatively constant field outlet temperature. The system is completely automatic in operation and requires minimum maintenance.

18433 **Solar industrial process heat application at the Southern Union Refining Company - a conceptual design.** Hudson, S.L. (Energetics Corporation, Richardson, TX). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 676-680(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Energetics Corporation (formerly Monument Solar Corporation) has recently completed the conceptual design of an industrial process heat solar system for the Southern Union Refining Company's Famariss Refinery in Lovington, New Mexico. A total solar field of 936 m^2 (10,080 ft^2) of concentrating parabolic trough collectors will provide heated heat transfer oil to a solar steam generator for the production of 1.28 MPa (170 psig) dry saturated steam at 191°C (375 F). System performance projections indicate that the annual solar system efficiency will be about 40% and will provide an annual equivalent fossil fuel energy savings of nearly 122,000 m^3 (4.3 MMcf) of natural gas. The system conceptual design and the associated engineering design considerations are discussed.

18434 **Solar industrial retrofit of a natural gas processing plant.** Henry, R.L.; McDowell, J.H. (Northrup, Inc., Hutchins, TX). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 681-685(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

This study was a joint effort by Northrup, Inc., and ARCO Oil and Gas Company to design a solar powered process heat system to be installed at the ARCO North Coles Levee Gas Processing Plant No. 8. Thermal energy for the process is supplied by a heat medium oil at temperatures of 301°C (575 F) to 193°C (380 F). Currently, this oil is being heated by two natural gas fired heaters and a heat recovery unit that operates on waste heat from a continuously operated gas turbine. The solar retrofit system is being designed to displace natural gas presently consumed in the heaters. The solar system will deliver solar energy to the process with an annual average efficiency of 58% and has been sized to yield an average solar fraction of 33% relative to the plant's normal annual usage of 83,450 MW/sub th/-hr.

18435 **Design, construction, and operation of a low-pressure solar steam facility.** Youngblood, S.B. (Acurex Corporation, Mountain View, CA). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 686-690(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Acurex Corporation has designed, constructed, and is now operating a solar facility that provides 345 F process steam to the Johnson and Johnson manufacturing plant in Sherman, Texas. The facility consists of 11,520 square feet of parabolic trough concentrating collectors, a 5,000-gallon flash boiler, and a 20-hp circulating pump. Experience gained through startup of the facility is summarized, and projected economics are discussed.

18436 **(DOE/R5/10136—2) Air medium solar heating system. Final report.** Miller, D.R. (Miller (Donald R.), Roseau, MN (USA)). [nd]. Contract FG02-79R510136. 17p. NTIS, PC A02/MF A01.

A demonstration of an air medium solar heating system retrofitted to an existing dwelling in a northern climate, latitude 48°N, is described. The collector measures 64 ft in length by 8 ft high and is located 40 ft from the dwelling. The air transfer is accomplished via 2 - 12 in. round PVC air ducts insulated with 1 in. of high density styrofoam, wrapped in roofing paper and running under ground from the collector to the basement of the dwelling. The house has 1800 sq ft on the main floor and 1000 sq ft of basement area. The R value of the house walls is 27 and the R value of the ceilings is 40. The frame of the collector is built entirely of wood - the top is shingled with conventional asphalt shingles which match the house. The actual heating of the air is accomplished as the air travels horizontally the length of the collector in a 2 in. by 48 in. by 64 foot long metal duct located on the bottom half of the collector. The air then returns by a similar duct on the top half of the collector and is delivered to the dwelling. This type of system is quite easy to ventilate in summer and may be ventilated and operated at the same time and still allow no unfiltered air into the system. The system uses 4 1/2 cubic yards of small rock as its storage medium. A 50 gallon water tank located in the rock storage canister serves as a water pre heater. The system uses one fan in addition to the existing fan in the oil fired heating system. (WHK)

18437 **(TVA/OP/ECR—81/28) Solar homes for the Valley: design portfolio.** (Tennessee Valley Authority, Chattanooga (USA)). [nd]. 24p. NTIS, PC A02/MF A01.

Descriptions are presented of 11 solar homes designed by TVA. Features of the passive heating and cooling system for the single-family homes are described; a picture of the house is shown; and a blueprint of the floor plan of each house is given. The 1000- to 2000-square feet houses employ several passive elements to achieve thermal comfort throughout the year. (MCW)

1410 Solar Collectors And Concentrators

REFER ALSO TO CITATION(S) 18315, 18316, 18319, 18320, 18352, 18424, 18429, 18434

18438 (DOE/CS/35299—T2) Performance of a solar-heating module for commercial-greenhouse use: Phase V. Final report. Buchanan, J.M. (Solar Thermal Systems, Burlington, MA (USA)). Jan 1981. Contract AC05-77CS35299. 40p. NTIS, PC A03/MF A01.

A large solar heat collector was constructed to assist the heat loads of a commercial greenhouse. The collector is an insulated, black-cavity with forced-air circulating to transfer the solar energy to water storage via air-to-water heat exchangers. Performance records reported herein indicate that the annual collection is 20% of the solar radiation received, and lower than the 50% originally estimated. The result is that the years before positive cash flow is increased from 10 to 25 years for a typical projection study. Recommendations are made for improving the solar collection module which, currently, has a performance that does not recommend its cavity-type design.

18439 (LA—8782-PR) Solar energy research at Los Alamos. Progress report, April 1, 1980-September 30, 1980. Reisfeld, S.K.; Neeper, D.A. (comps.). (Los Alamos Scientific Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 45p. NTIS, PC A03/MF A01.

Continuing research is described on collector testing, the National Security and Resources Study Center active system study, monitored buildings data analysis, and performance predictions for passive solar heated buildings. New work concerned salinity gradient solar pond theoretical calculations, the thermosyphon collector experiment, and solar materials analysis and testing. Accounts are also given of technical support to the Office of Solar Applications for Buildings, US Department of Energy, and of technology transfer to the scientific community, building industry, government departments, and the general public. (MHR)

18440 (SAND—79-8186) Cellular-glass continuous process. Final report. (Solaramics, El Segundo, CA (USA)). Aug 1980. Contract AC04-76DP00789. 85p. NTIS, PC A05/MF A01.

The objective of the program is to develop and demonstrate feasibility of processing techniques required for continuous production of cellular glass suitable for heliostat reflective module substrates. The concept of utilizing cellular foamed glass for the mirror module substrate is described. Characteristics which need attention are: the availability and cost addressed throughout the continuous process; improved strength and reduced weight achieved by variable density through the thickness, i.e., generation of a dense skin over a lightweight core to achieve a more efficient sandwich structure; and improved environmental and impact resistance which is achieved by closed cell structure and the dense surface skin. Sections cover in detail heliostat application (design consideration and requirements, mechanical properties of cellular glass, sandwich panel design analysis); production process description; operational experience; test material evaluation; and cost projections. A summary of events for a 20-day run for the production of a batch is presented. (MCW)

18441 (SAND—79-8281) Design, cost, and performance comparisons of several solar thermal systems for process heat. Volume III. Receivers. Woodard, J.B. Jr. (Sandia National Labs., Livermore, CA (USA)). Mar 1981. Contract AC04-76DP00789. 114p. NTIS, PC A06/MF A01.

The receiver subsystem converts reflected solar radiation into thermal power by heating a working fluid. The objective of the task described was to estimate the cost and performance of the receiver subsystem for parabolic troughs, parabolic dishes, and central receivers over a wide range of temperatures and power levels for thermal power applications. This volume presents the fundamental design philosophy employed, the constraints identified, the tradeoffs performed and the cost and performance results obtained for each receiver in the study matrix.

18442 (SAND—79-8282) Design, cost and performance comparisons of several solar thermal systems for process heat. Volume IV. Energy centralization. Iannucci, J.J.; Hostetler, L.D. (Sandia National Labs., Livermore, CA (USA)). Mar 1981. Contract AC04-76DP00789. 94p. NTIS, PC A05/MF A01.

A large matrix of self-consistent piping systems for dishes, troughs, and central receivers, are designed, costed, and analyzed for performance. The solar installations collect thermal energy at temperatures ranging from 200°F to 2000°F, at sizes of 3, 30, 300, and 1500 megawatts thermal. First order design differences and similaries are highlighted, with special emphasis on the comparison of dish and trough piping. Dishes are found to require the most costly and thermally inefficient piping networks due to the large length of piping required.

18443 (SAND—79-8283) Design, cost and performance comparisons of several solar thermal systems for process heat. Volume V. Systems. Eicker, P.J.; Hankins, J.D.; Hostetler, L.D.; Iannucci, J.J.; Woodard, J.B. (Sandia National Labs., Livermore, CA (USA)). Apr 1981. Contract AC04-76DP00789. 78p. NTIS, PC A05/MF A01.

Conceptual designs have been obtained for central receiver, parabolic dish and parabolic trough systems used in several industrial process heat applications. The estimated cost of energy from these systems is presented. The system level trade studies which determined the optimal collector spacings are discussed. The assumptions used in the study relative to economics, maturity of technologies, costs of nonsolar equipment, nomenclature, etc. are also presented. Finally, the appendices discuss the models used to calculate field performance and present detailed information on subsystem cost and performance.

18444 (SAND—81-0075C) Studies of dust accumulation on solar-mirror materials. Pettit, R.B.; Freese, J.M.; Roth, E.P. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 22p. (CONF-810137—1). NTIS, PC A02/MF A01.

From Solar thermal test facility (STTF) workshop: STTF testing for long-term system performance; Albuquerque, NM, USA (7 Jan 1981).

During outdoor exposure, solar mirror materials accumulate dust particles that can substantially reduce the intensity of the specularly reflected beam. Studies have shown that there is a complex interaction between significant variables such as the mirror material, local weather conditions, mirror orientation, and cleaning procedures. Investigation of different water spray cleaning techniques has shown that the specular reflectance even after repeated cleanings shows a slow, continued decrease for all cleaning procedures studied. Spraying with deionized or soft water were the most effective cleaning procedures. Cleaning with very dilute HF solutions can, however, restore the reflectance to its original value.

18445 Effect of natural soiling and cleaning on the size distribution of particles deposited on glass mirrors. Roth, E.P.; Anaya, A.J. (Sandia Lab., Albuquerque, NM). *Transactions of the ASME (American Society of Mechanical Engineers)*; **102**: No. 4, 248-256(Nov 1980).

The particle size distribution and the reflectance properties of silvered glass mirrors exposed in an outdoor environment have been measured to determine the separate effects of natural soiling and natural cleaning (wind and rain). The wavelength dependent diffuse reflectance was correlated with the particle size distribution function for mirrors exposed to increasing periods of outdoor exposure. 18 refs.

18446 Design and test of non-evacuated solar collectors with compound parabolic concentrators. Rabl, A.; O'Gallagher, J.; Winston, R. (Univ of Chicago, Ill). *Solar Energy*; **25**: No. 4, 335-351(1980).

The paper summarizes more than 3 yr of research on nonevacuated Compound Parabolic Concentrator (CPC) and reviews measured performance data and critical design considerations. Concentrations in the upper portions of the practical range can provide good efficiency (40-50 percent) in the 100-160°C temperature range with relatively frequent tilt adjustments (12-20 times per year). Test procedures are described. 21 refs.

18447 Simple method to establish salt gradient solar ponds. Zangrando, F. (Univ. of New Mexico, Albuquerque). *Solar Energy ;* **25**: No. 5, 467-470(1980).

The simplest and most expedient way to establish and modify a gradient is discussed. The procedure consists of partially filling the pond with high salinity brine; fresh water is then pumped through a diffuser which is immersed in the upper portion of the existing solution. The diffuser is subsequently raised to the surface, either in a continuous motion or in discrete steps. Experience shows that steps up to 5 cm work well. The brine above the diffuser will be progressively diluted while the diffuser, as well as the water level, rises. Timing must be such that the diffuser reaches the surface at the predetermined final level of the pond. 5 refs.

18448 Thermal energy centralization networks; design, cost, and performance for dish, trough, and central receiver systems. Iannucci, J.J. (Sandia Labs., Livermore, CA). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 44-48(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

By nature, solar energy is diffuse; for most applications it must be collected and transported to be of any value. Energy centralization is the process of energy transport once the concentrating collectors (central receivers, dishes, and troughs) have put the diffuse insolation into a movable form: sensible heat which has been added to a working fluid. This centralization process entails all that must be done to accumulate the power from the receivers and pipe it to, or near, a single end-use location. The purpose of this presentation is: (1) to illuminate the design principles and concerns of generic energy centralization systems for dishes, troughs, and central receivers and (2) to provide cost and performance baselines for such systems so that overall systems can be developed which are cost effective.

18449 Experimental testing of a single tube analogue of a solar thermochemical receiver. Wright, J.H.; Lenz, T.G. (Colorado State Univ., Fort Collins). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 94-98(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

An experimental program is underway to determine the feasibility of using a reversible ammonia dissociation-synthesis reaction to collect and transport high-temperature solar energy. A 10 kW/sub th/ solar receiver-ammonia dissociation reactor-heat exchanger module has been designed. Testing of catalyst substrate materials in a small reactor which models a single tube of the 10 kW/sub th/ reactor is described. Various alumina substrate materials and a nickel-loaded catalyst have been subjected to up to 820 thermal cycles (100 to 700°C) to investigate their response to thermal cycling and possible degradation which could potentially limit catalyst lifetimes in solar receiver applications. The 820 thermal cycles successfully tested correspond to more than a full year of service in a solar receiver application, and are thus encouraging results for the distributed thermochemical receiver concept.

18450 Solchem thermochemical tests and demonstrations at New Mexico State University. McCrary, J.H. (New Mexico State Univ., Las Cruces); McCrary, G.E.; Clark, D.H.; Chubb, T.A. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 99-103(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

An extensive test program has been conducted at New Mexico State University during the past year to demonstrate the feasibility of the thermochemical conversion of solar energy - Solchem. These tests also have contributed to the optimization of parameters needed in the design of thermochemical receivers. Two chemical cycles are presently being considered for use in energy conversion systems. These cycles utilize the dissociation of SO_3 and the CO_2 - CH_4 reforming reaction. Separate laboratory facilities have been assembled and are being used to conduct experimental investigations of these two chemical cycles. In December 1979 a thermochemical receiver which utilized the CO_2-CH_4 reforming reaction was installed on the White Sands Solar Furnace and was operated for two weeks in a demonstration of the Solchem concept.

18451 Air leakage effects on active air-heating solar collector system performance. Jones, D.E.; Shaw, L.E.; Lof, G.O.G. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 291-295(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Air leaks into air-based solar-heating systems are a reality and it does not appear that total elimination of the leaks is economically feasible or desirable in some applications. A method of determining the worst case effect of collector duct leakage on instaneous system performance is presented, and a procedure for estimating the worst case effect of leakage on long-term performance is suggested. Although air leaks into a collector array can be beneficial in some applications, depending on the nature of the load, analysis is carried out without these beneficial effects included.

18452 Simple balancing technique for liquid cooled flat plate solar collector arrays. Knowles, D.S. (Rockwell International, Canoga Park, CA). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 300-303(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A simple method for balancing flow rates in arrays of parallel connected flat plate solar collectors has been developed. The method is based on a computer program which solves for the flow rate through each of the collectors in a reverse return plumbed array. The analysis uses conventional K-value techniques and assumes the effects of density variations within the system to be negligible. The parameters of major importance in the analysis include: (1) collector pressure drop characteristics, (2) sizes of the inlet and outlet manifold lines, (3) collector inlet and outlet sizes, and (4) the number of collectors in the array. It has been found that by appropriately sizing the inlet and outlet manifolds, flow maldistribution can be nearly eliminated without resorting to expensive or complicated balancing techniques.

18453 Development of performance information for large scale solar pond applications. Newell, T.; Pande, J.; Boehm, R. (Univ. of Utah, Salt Lake City). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 376-380(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Work related to the development of performance information for large scale salt-stratified solar ponds is described. Included are descriptions of both numerical and experimental models.

18454 Design and initial operation of a 400 m^2 solar pond. Nielsen, C.E. (Ohio State Univ., Columbus). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 381-385(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The initial operation of a 400 m^2 salinity gradient solar pond designed to provide reliable energy balance and efficiency data suitable for comparison with a mathematical model is reported. The pond is circular, 4.5 m deep at the center, and 1.5 m%deep at the vertical insulated walls. It is surrounded by a water-filled moat. There is an extensive array of buried thermocouples in the earth under the pond and moat. Radiation penetration is measured with a submersible pyranometer of the university's design and construction. Temperature distribution in the pond is measured both with a vertically scanning platinum resistance sensor and with an array of fixed sensors. Data on the initial warm-up are presented and the energy balance is calculated. A procedure for determining radiation absorption from pond temperature data is presented, and the possible accuracy of such determination is estimated from experimental temperature records.

18455 Monitoring sodium chloride concentrations and density profiles in solar ponds by electrical conductivity and temperature measurement. Fynn, R.P.; Short, T.H.; Badger, P.C.; Sciarini, M.J. (Ohio Agricultural Research and Development Center, Wooster). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 386-390(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A simple accurate and semi-automatic system was developed for monitoring sodium chloride concentrations and density profiles

in a solar pond. The profile meter, which measures pond solution conductivity and temperature, and the equations which convert this data into salt concentration and/or brine density, are covered in detail so that any potential users may construct their own equipment. The use of the profile meter, its advantages and disadvantages, are discussed. Emphasis is placed on the day-to-day profile monitoring that the conductivity-temperature method enables, and the use of the meter during modification of the pond profiles. A program is also available to calculate the pond profile using a Hewlett-Packard HP-97 programmable calculator.

18456 **One year's experience with an operating saturated solar pond.** Ochs, T.L.; Stojanoff, C.G.; Day, D.L. (Univ. of Nevada, Reno). Contract AS04-79CS30174. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 391-394(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

While the saturated non-convecting solar pond concept is not new, the borax pond at the Desert Research Institute (DRI) is the first application of the concept to an operating solar pond. As with any new application there have been experimentally identified problem areas. Four of these problems are discussed: 1) departure from saturation, 2) contamination, 3) bottom crystalization, and 4) covers.

18457 **Overview of the DOE national and international program for salt gradient solar ponds.** Sargent, S.L. (DOE/SERI Site Office, Golden, CO); Neeper, D.L. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 395-399(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Salt-gradient solar ponds offer a unique combination of low-cost solar collection and long-term storage for a variety of low-temperature thermal applications. The pond programs in the U.S. and Israel are reported, the current state of the technology is surveyed, and the future direction of the U.S. pond program is predicted.

18458 **Problems of treating U/sub L as a constant.** Bowen, J.C. (AMETEK/Power Systems Group, Ivyland, PA). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 400-404(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Wind speed, ambient temperature and tilt angle effects are discussed as they impact ASHRAE 93-77 test points. The use of ASHRAE 93-77 test data which does not account for these effects and which treats the loss coefficient U/sub L/ as a constant can underestimate the thermal performance of solar collectors and systems.

18459 **Comparison of solar simulator and outdoor ASHRAE standard 93 thermal performance tests.** Streed, E. (National Bureau of Standards, Washington, DC); Dawson, A.; Lunde, A. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 405-409(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Standard test methods for determination of solar collector thermal performance permit the use of solar simulators A comparison of efficiency measurements for seven collectors of varying construction and materials is used to illustrate the high bias in results when using two types of solar simulators as compared to outdoor measurements. Spectral distribution, sky temperature and collector tilt angle are shown to be parameters that must be considered in addition to the normal environmental test conditions of wind, irradiance, diffuse fraction and ambient temperature when comparing indoor and outdoor test results.

18460 **Solar air preheaters.** Besant, R.W.; Schoenau, G.J.; Figley, D.A. (Univ. of Saskatchewan, Saskatoon). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 410-414(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Four different simple low cost solar air preheaters have been investigated. Experimental tests and analytical models indicated that this type of collector has an efficiency which is very sensitive to the air coolant flow rate, solar irradiation and its distribution, ambient temperature and wind speed over the collector. Variations in efficiency due to changes in these terms are so large that it is somewhat misleading to present the performance of such collectors by a single efficiency curve. The glazing material and absorber plate radiation properties could play an important role in determining the useful heat output, especially if selective surfaces are used, however, cost considerations will usually mean that low cost construction materials will be used on applications such as building ventilation systems or agricultural crop drying.

18461 **Influence of environmental exposure on solar collectors and their materials.** Waksman, D. (National Bureau of Standards, Washington, DC); Streed, E.; Dawson, A. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 415-419(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Efforts in the development of reliability/durability tests for solar collectors and their materials have been hampered by the lack of data on the real time and accelerated degradation of these materials. Research related to the development of standards for evaluating the reliability and durability of cover plate and absorber materials used in flat plate solar collectors is discussed. In this research, several different types of collectors, cover plates and absorbers are being studied in laboratory and field tests. Optical property measurements are being performed in conjunction with aging tests intended to induce degradation in the materials. The aging tests include accelerated laboratory exposure of material specimens and outdoor exposure of these materials in simulated solar collectors. Full-size solar collectors in which several of these materials are used are being concurrently subjected to outdoor and solar simulator exposure. Changes in thermal performance at the collector level are being compared with changes in optical properties at the materials level. The results obtained in the first year of this study are presented.

18462 **Survey of evacuated solar collectors.** Graham, B.J. (Trident Engineering Associates, Inc., Annapolis, MD). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 420-423(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

There are some 30 solar collectors of various designs which use an insulating vacuum region to protect the absorber from heat losses. The designs include long Dewar-type tubes, single evacuated tubes containing an absorber, and flat plate-type collectors with a cover of evacuated tubes. To date, there are four evacuated tube collectors which have been tested, used in demonstration sites, and made available to the market on a limited basis. Recent developments in evacuated collectors include use of air as the heat transfer medium, use of CPC reflectors, and introduction of a heat pipe.

18463 **Evacuated tube collectors are not flat plates.** Schultz, W.E. (Wyle Labs., Huntsville. AL); Banks, M.E.; Wiesenmaier, B. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 423-427(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Explicit test results are provided which hopefully will lead to additional test procedures to make ASHRAE 93-77 and NBSIR 1305A acceptable for testing evacuated tube collectors and to promote a standard procedure for utilizing ASHRAE 93-77 test results to assist solar system designers in making proper application of the data. The appropriate choice of collectors and collector array size is generally based on the thermal performance of collectors which have been tested to the current baseline testing standard, ASHRAE 93-77. Unfortunately, the standard does not specify proper utilization of the test results, and quite often the incident angle modifier is ignored in sizing collector array arrangements, resulting in undersized arrays for flat plates and possible oversized arrays with evacuated tubes.

18464 **Transmittance-absorptance product for concentric tubular collector elements, developed for the three-dimensional case.** Janke, S.H. (Montana State Univ., Bozeman). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 428-432(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A method is presented for calculating the overall transmittance (tau/sub e/) and the transmittance-absorptance product (tauα) for an absorber of circular cross section mounted concentrically within a tubular glass envelope, also of circular cross section, for the general condition in which the direct incident rays lie in planes not perpendicular to the long tubular axis. Assumptions are that the tube is very long in comparison with its diameter, that the space between envelope and absorber is evacuated, that the absorbing surface is specular and of constant absorptivity regardless of incident angle, and that the incident radiation is collimated. Account is taken for absorption of energy within the envelope. Results in chart form display the variation in the product with incident angle (the angle by which incident rays differ from perpendicular to the long tubular axis), with the envelope's refractive index, with the absorptivity of the receiving surface, and with the ratio of absorber to envelope diameter. These findings indicate that the tauα product falls off only slightly as the angle of incidence varies from zero to moderate (up to 40°) values.

18465 **Development of a high performance air heater through use of an evacuated tube cover design.** Jones, D.E.; Shaw, L.E. (Solaron Corp., Englewood, CO). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 433-436(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Development of a high performance air heater through use of an evacuated tube cover design is described. The cover design utilizes evacuated fluorescent light tubes laid parallel in a close packed array to form an inner transparent glazing over a conventional metal absorber plate with flow behind the plate. A tempered flat glass plate was used as an outer glazing. Both clear and infrared reflective (IR) tubes were investigated. Solar transmittance tests indicate that the clear tube array has a higher transmittance than two flat sheets of low-iron glass. The IR coating produced substantial transmittance loss. Thermal conductance tests indicate that the tubes behave similar to two flat glass sheets with a vacuum in between. The IR reflective coating was only marginally effective at reducing heat conductance. Final prototype designs are presented along with collector performance estimates.

18466 **Convective heat transfer in trough and CPC collectors.** Meyer, B.A.; Mitchell, J.W.; El-Wakil, M.M. (Univ. of Wisconsin, Madison). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 437-440(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Natural convection heat-transfer coefficients have been experimentally determined for trough-type collectors. The effects of Rayleigh number, tilt angle, and ideal concentration ratio on the Nusselt number have been experimentally determined over ranges representative of collector operation. The Rayleigh number range tested was up to 10^7, the tilt angle was varied from 30 to 90 degrees and ideal concentration ratios of 2 and 3 were tested. The experimental results are supported by finite element solutions to the governing equations. A method of extending the results of trough collectors to CPC collectors is suggested. The convective losses are compared to those from conventional flat plate collectors. These results are useful to designers of collectors of this type, and allow estimation of the thermal losses during operation.

18467 **Theory and experiment on heat loss coefficients for plastic covers.** Hollands, K.G.T.; Wright, J. (Univ. of Waterloo, Ontario). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 441-445(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

An efficient algorithm for solving the set of linear governing equations resulting from the analysis of the total heat transfer across an arbitrary number of opaque or partly transparent inner covers in a flat plate solar collector is presented. The governing equations to the problem have been recently formulated by Hassan but the present set are more general in that they allow for the inner covers to have different radiant properties depending upon the direction of the incident or emitted longwave radiation. The theory is verified by experiments using Teflon as a single cover, and bounding plates of various emissities. The theory has been used to demonstrate that, if the absorber plate has a selective surface, an inner cover transparent to long wave radiation is to be preferred (over one which is opaque).

18468 **Effects of operating conditions on the performance of honeycomb and conventional flat plate solar collectors.** McMurrin, J.C. (Jet Propulsion Lab., Pasadena, CA); Buchberg, H. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 446-450(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A comprehensive analytical study of the sensitivity of flat plate solar collector performance to operating conditions is reported. A single-glazed collector with a high performance double-sinusoidal glass honeycomb is studied, along with conventional single-glazed collectors with and without selective black absorber and a double-glazed collector. Top and bottom loss coefficients are calculated with recent theoretical and experimental heat transfer correlations. Effects of seven operating variables are analyzed.

18469 **Comparison of transpired beds for solar collector applications.** Collier, R.K.; Arnold, F.H. (Solar Energy Research Inst., Golden, CO). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 451-455(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

One of the main problems in dealing with transpired air heaters is that collector performance has been difficult to characterize. Although the performance of a given collector could be measured, the effects of parameter changes could not be predicted. As a result, the only way to evaluate a transpired air heating solar collector concept has been to build one, blow air through it, and measure the efficiency. Experimental data from previous research that included volumetric heat transfer coefficients, optical extinction coefficients and pressure drops is reduced to a common format. This reduced form is then displayed in a manner such that quantitative decisions regarding transpired absorber performance can be made between the various types tested (mesh, screen and glass). In addition, the work by Neeper is expanded such that the collector performance maps of the candidate designs are predicted and compared to those of the traditional flat plate variety.

18470 **Low-cost solar collectors using thin-film plastics absorbers and glazings.** Wilhelm, W.G. (Brookhaven National Lab., Upton, NY). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 456-460(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The design, fabrication, performance, cost, and marketing of flat plate solar collectors using plastic absorbers and glazings are described. Manufacturing cost breakdowns are given for single-glazed and double-glazed collectors. (WHK)

18471 **Versatile transparent polymer collector.** Williamson, R.T. (Ramada Energy Systems, Inc., Tempe, AZ). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 461-464(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Solar collector development in the past has been designed to create specific products for specific applications. As a result, there has been a proliferation of relatively expensive, limited-use collectors. A new generation of collector, the transparent polymer collector, promises to bring collector costs back down to a reasonable level. Because of lower material and labor costs as well as the numerous uses of the collector, the economics of this new generation of collector look very promising. It can be utilized as an active collector, passive glazing, or in a number of potential hybrid applications.

18472 **Performance of a tube and cloth collector using down-flow air circulation.** Hewett, L.D. (Texas A and I Univ., Kingsville). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 465-469(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The design, analysis, and testing are described of a flat-plate solar collector whose inner glazing consists of a layer of clear glass tubes and whose absorber plate consists of a sheet of black cloth. Air passing through the collector is heated as it circulates downward through the cracks between the tubes and the holes in the cloth. This unique combination of geometry, materials, and flow pattern has resulted in a durable collector of superior performance costing only a fraction of the amount of other typical flat plate collectors. Attempts to optimize the design were made by using both a 0.1 m^2 stagnation box and a 1.28 m^2 operating collector, artificial and natural sunlight, evacuated and air-filled tubes, horizontal and vertical tube orientations, and by varying such parameters as tube spacing, air flow rate, cloth type, and tilt angle.

18473 Selection and test of high temperature solar collector adhesives. Dame, R.E. (Mega Engineering, Silver Spring, MD). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 470-474(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A summary of results for a test program directed at evaluating candidate adhesives which could be used for bonding flat plate solar collector absorbers is presented. Temperature performance, structural integrity and thermal conductivity for candidate adhesives are presented along with typical test performance for a bonded solar collector. These results are part of a Department of Energy Solar Heating and Cooling Research and Development Branch Office of Conservation and Solar Applications funded project.

18474 Solar thermal test facility for 60 to 300°C located in tropics. Oezakcay, L.M.; Lopez, A.M.; Ortabasi, U. (Center for Energy and Environment Research, Mayaguez, Puerto Rico). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 485-487(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

To measure the parameters determining and affecting the thermal efficiency of concentrating collectors operating in the 60 to 300°C range under tropical conditions, a test facility is designed and constructed at Center for Energy and Environment Research, Mayaguez, Puerto Rico. Besides standard instantaneous efficiency, heat loss, angular dependence, and time constant tests, this system will also be used to determine day long energy collection rates. Collectors with a net aperture area up to 5 square meters can be tested to 300°C. The heat transfer liquid flow rate is continuously adjustable between 0.87-8.7 lt min^{-1}. The test loop consists of hold and expansion tanks, circulating pump, filter, temperature controllers, temperature, insolation, and flowrate transducers and monitors and a heat rejection system. Data acquisition is done by a microprocessor-based data logger and the data analysis is done by a desk top computer.

18475 Test experience at the DOE/Sandia Midtemperature Solar Systems Test Facility. McCulloch, W.H. (Sandia National Labs., Albuquerque, NM). Contract AC04-76DP00789. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 488-490(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Since 1972, Sandia Laboratories, Albuquerque, NM, has been involved in the study, design, construction, testing, and evaluation of solar energy systems. Some of the insights and experience acquired during this period is presented. While the intent is to include only those conclusions that can be supported by actual hardware experience at the DOE/Sandia Midtemperature Solar Systems Test Facility, space constraints do not permit the inclusion of test data and other evidence.

18476 Elastic bent plate concentrators. Dame, R.E. (Mega Engineering, Silver Spring, MD). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 496-500(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Methods have been developed to make optically accurate cylindrical parbolic solar concentrating reflectors from flat metal, plastic, or other thin elastic plate materials without special tooling. Some theoretical and experimental work underway at Mega Engineering to develop elastically deformed reflectors for what could become extremely low cost and optically accurate solar collector concentrator reflectors is described. These reflectors are formed by elastically bending thin reflective sheets of metal or plastic to form cylindrical parabolic solar collector concentrators. The results of structural studies which evaluated thin plate materials to minimize gravity sag of collector reflectors are presented. Finally, typical costs and thermal performance are presented.

18477 Stationary concentrators for tubular evacuated receivers: optimization and comparison of reflector designs. McIntire, W.R. (Argonne National Lab., IL). Contract W-31-109-ENG-38. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 505-509(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Tubular evacuated receivers such as those manufactured by Owens-Illinois and General Electric Company offer considerable potential for cost-effective solar collectors for heating and cooling and for industrial process heat applications. The receivers were originally introduced in collectors having simple reflector shapes to augment the receiver tube area presented to the sun. More recent commercial collectors use nonimaging concentrators. Comparisons of the optical efficiencies of the different collector designs are presented as a function of incident angle, and the factors which determine the optical performance of a given concentrator design are discussed. Although different concentrator designs would be recommended for various combinations of receiver characteristics, collector materials, manufacturing costs and operating temperatures, it is clear that optimized nonimaging concentrators, originated by Winston and further developed at both the University of Chicago and Argonne National Laboratory offer substantial advantages over other concentrator designs for the concentration ratios of interest.

18478 Analytical/experimental study of the optical performance of a transmittance-optimized linear Fresnel lens solar concentrator. O'Neill, M.J.; Waller, R.A. (E-Systems, Inc., Dallas, TX). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 510-514(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A transmittance-optimized linear Fresnel lens solar concentrator has been developed. The optical performance of the lens has been analytically predicted, using the method of cone optics, to define the radiant flux profile in the focal plane. Also, the optical performance of the lens has been experimentally determined, using a focal plane radiant flux scanner, under actual solar illumination. A brief description of the lens, its predicted performance, and its measured performance is presented.

18479 Incremental feedforward temperature control of large solar collector fields. Lowthian, W.E. (Kinetics Consulting Group, Atlanta, GA); Black, D.L. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 529-533(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Large fields in which collectors are coupled in long series arrangements have unusual control problems and constraints due to large time constraints, fluid flow velocities which are comparable to cloud shadow velocities and field dimensions which are comparable to shadow dimensions. These problems are further aggrevated by the use of reflecting type collectors because of their low thermal capacitance and on-off energy reception due to shadows. Feedback control technique are unable to cope with these problems without subdividing the field into numerous control segments, a costly strategy. These difficulties are largely eliminated by a strategy called Incremental Feedforward Control. The technique has good steady-state and dynamic characteristics, is reliable, and becomes more attractive as field sizes increase.

18480 Design of nonimaging concentrators as second stages in tandem with image-forming first-stage concentrators. Greenman, P. (Univ. of Chicago, IL); O'Gallagher, J.; Winston, R.; Welford, W.T. Contract FG02-79ET00089. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 544-547(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The flux concentration of paraboloidal mirrors of short focal ratio may be enhanced to near the thermodynamic limit by the addition of low concentration (2-4X) nonimaging concentrators such as compound elliptical concentrators or hyperbolic trumpets. An outline of the design procedure and the results of ray trace analysis are presented.

18481 Progress in point-focusing solar concentrator development at JPL. Carley, W.J. (Jet Propulsion Lab., Pasadena CA). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 548-552(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Point-Focusing Distributed Receiver Technology is being developed by the Jet Propulsion Laboratory as part of the Solar Thermal Power Systems Project for the U.S. Department of Energy. Two First-Generation Concentrator designs, the Test-Bed Concentrators (TBC) and the Low-Cost Concentrator (LCC), are described. Fabrication of the TBC structure and the JPL-developed mirror facets is also described. The TBCs are installed at JPLs Parabolic Dish Test Site (PDTS), and are undergoing performance characterization testing. The LCC is nearing completion of detail design and will be installed at the PDTS by the end of the year.

18482 Solar receiver enclosure enhancement by controlled directional scattering. Winston, W. (Univ. of Chicago, IL). Contract AC02-80ER10575. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 596-599(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The interest in efficient solar collector design has stimulated investigation of two-dimensional (trough-like) cavity structures. A novel principle for designing cavity enclosures is described. The present method maintains high transmission albeit at the expense of some concentration in the presence of gaps as large as the radius between reflector and receiver. The new method can be applied to advantage to nonimaging concentrator design as well as to line focus concentrators.

18483 Elinination of the optical losses due to gaps between absorbers and their reflectors. McIntire, W.R. (Argonne National Lab., IL). Contract W-31-109-ENG-38. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 600-604(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A characteristic of ideal nonimaging concentrators is the fact that the theoretical reflector required in practical solar collectors leads to large optical losses and reduction in optical efficiencies. A new type of concentrator design for tubular absorbers is presented. These reflector designs have higher optical efficiencies than the original nonimaging optics designs, because they eliminate the gap losses, and because they allow some of the light reflected from the absorber tube and its cover shroud to be reflected back onto the absorber. The new reflector designs have potential for stationary concentrators for tubular evacuated receivers and for secondary concentrators for linear focusing systems.

18484 Optical losses and heat transfer in an evacuated tubular absorber under 5x nonimaging concentration. O'Gallagher, J.; Hilgart, M.; Snail, K.; Winston, R. (Univ. of Chicago, IL). Contract AS02-76ET20236;AS02-78ER04657;AC02-80ER10558. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 605-609(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The use of nonimaging cusp type Compound Parabolic Concentrators (CPC's) of low concentration (1.1X-1.5X) with evacuated dewar type absorbers is well established. However, at higher concentration ratios (3X to 6X), because of the higher fluxes incident on the absorber and the relatively nonuniform flux distribution in these cases, the possibility that inadequate heat transfer would cause an overtemperature condition in the absorber has been a concern. The results of extensive operating experience with a 5.25X CPC are summarized. This collector used General Electric evacuated tubes and was built with Sheldahl silver foil mirrors. The system had an optical efficiecy (with an acrylic cover) of n/sub o/ = 63 $^{+-}$ 1% relative to beam radiation and the best high temperature performance measured to date was an operating efficiency of 58 $^{+-}$ 4% at an average fluid temperature of 220°C above ambient. A detailed breakdown of the individual contributions to the optical losses shows that the observed efficiency is in very good agreement with material properties and a ray trace analysis. In general, heat transfer has not proved to be a serious problem although substantial temperature gradients have been measured in the absorber on the copper fin heat extraction fin. Results are reported.

18485 Experimental test of a facetted, non-imaging solar concentrating collector. Lopez, A.M.; Ortabasi, U.; Atienza, J.A.; Oezakcay, L.M. (Center for Energy and Environment Research, Mayaguez, Puerto Rico). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 610-614(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Preliminary tests of an experimental collector designed to produce process heat up to 300°C are reported. The collector is a modular nonimaging trough concentrator (5.25X) whose mirror surface consists of planar facets sealed inside low cost glass tubes. The absorber is a cylindrical fin inside an evacuated glass tube. The behavior of the absorber tube independent of the concentrator was studied. Time constants of 1 to 4 minutes were measured at different flow rates. By measuring the optical efficiency of the absorber, its $\alpha\tau$au product was determine as 0.80. A transient behavior test was used to measure the collector overall heat loss coefficient throughout a wide range of temperatures. Preliminary measurements of the collector optical efficiency were carried out and are compared to theoretical predictions.

18486 Monte Carlo modeling of non-tracking concentrator using light trapping techniques. Gordon, B.A.; Knasel, T.M.; Houghton, A.; Bain, C.N. (Science Applications, Inc., McLean, VA). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 615-617(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

Monte Carlo methods have been used to model the performance of a non-tracking solar collector which uses light trapping to provide concentration. Light trapping results from total internal reflection of light diffused from the bottom surface of the cover sheet of the collector. Gains of 20% to 30% are readily achievable, and have been measured on a simple prototype.

1420 Heat Storage

REFER ALSO TO CITATION(S) 18248, 18372, 18407, 18449, 18450, 18453, 18454, 18455, 18456, 18457, 18475

18487 (DOE/CS/34479—3) Numerical and experimental studies of liquid storage tank thermal stratification for a solar energy system. Wu, S.T.; Han, S.M. (Alabama Univ., Huntsville (USA). Dept. of Mechanical Engineering). Nov 1980. Contract AS02-77CS34479. 81p. NTIS, PC A05/MF A01.

The results of theoretical and experimental studies of thermal stratification in liquid energy storage tanks for the performance of solar energy systems are presented. The investigation was divided into three areas: (I) Justification of the Importance of Thermal Stratification Inside the Energy Storage Tanks, (II) Development of a Simple Mathematical Model which is Compatible with Existing Solar Energy System Simulation Code, and (III) Validation of Mathematical Models by Experimental Data Obtained from Realistic Solar Energy System Operations.

18488 **(DOE/SF/01929—T2) Improved, inexpensive solar-energy-heating heat reservoir. Final report.** (Garrett Energy Research and Engineering Co., Inc., Ojai, CA (USA)). 7 Feb 1979. Contract FG03-78SF01929. 73p. NTIS, PC A04/MF A01.

The use of a salt hydrate, sodium sulfate decahydrate (glauber salt) to increase the heat storage capacity of a solar space heating system was studied. The rheological properties of the solids slurry was altered by modifying the crystal habit of glauber salt so as to form small chunky crystals and by using a viscosity modifier. Various additives to modify the crystal form habit were found; and though none were completely successful under pilot plant conditions, dodecylamine HCl and Monsanto dequest were quite effective in the laboratory. Additional screening studies are required. An alginate viscosity modifier altered the surface tension of the slurry so as to prevent plugging and maintain a pumpable slurry. The slurry was contacted with air in a direct contact heat transfer column. The efficiency of the heat transfer decreased as the viscosity of the slurry increased. However, this is not a limiting factor and air temperatures of 80 to 82°F can be achieved. The slurry was found to be suitable for a radiant heating system and could be quite economically effective immediately. The storage capacity with a glauber salt slurry is about twice that of water with a potential of three times with improvement. A more important aspect of using the slurry is the increase in collector efficiency due to the decreased storage temperature. This could have the effect of halving the required collector area.

18489 (DOE/SF/01964—T1, pp 2-4) **Development of photochemical reactions for solar energy storage.** Olmstead, J. III. (California State Univ., Fullerton). Sep 1980. NTIS, PC A06/MF A01.

In Solar energy storage projects. Final report.

Six photochemical systems were investigated for solar energy storage applications, with four systems shown to be unsuitable for such applications, and two systems with promising characteristics in need of further study. Photocycloaddition of 9-cyanoanthracene with substitued furans, photosensitized oxidations, and photocycloaddition of cyclohexadiene to 9-cyanoanthracene were found to be exothermic. Endothermic photoredox reactions of iron and thionine produced unstable photoproducts. Only photoisomerization of aromatic azo compounds and photoisomerization of t-butyl substituted anthracenes showed promise of useable solar energy storage, although the low storage efficiency of azobenzenes and high production costs of anthracenes require further study. Norbornadiene has been identified by other workers as another possible system.

18490 (DOE/SF/01964—T1, pp 62-96) **Stratifiable liquid thermal storage for solar energy.** Stary, M.L. (Stary, (Marvin L.), Claremont, CA). Sep 1980. NTIS, PC A06/MF A01.

In Solar energy storage projects. Final report.

A stratifiable liquid thermal storage unit for storing the heat energy from air-cooled solar collectors was developed, designed, fabricated and tested. The thermal storage unit consists of a number of layers of closely-packed tubes, each tube containing a liquid heat sink. A mathematical model of the heat transfer processes within the thermal storage unit was developed and used to predict the time/temperature distribution within the storage bed. Tubular materials were evaluated and an ABS plastic tube was selected for use in the test unit. A test unit was designed, fabricated and tested. Test data confirmed the predictability of the heat capacity and time/temperature profile. Cost effectiveness of the stratifiable liquid thermal storage system was evaluated by comparing costs of a typical system with costs of a conventional rock bed thermal storage system. The liquid system was found to be cost effective.

18491 (DOE/SF/01964—T1, pp 97-107) **Heat storage system.** Bieri, J.; Haas, F. (Heliodyne, Inc., Richmond, CA). Sep 1980. NTIS, PC A06/MF A01.

In Solar energy storage projects. Final report.

This project was undertaken to test the economic feasibility of solar energy storage modules consisting of concrete mixed with different additives. The thermal behavior of four blocks with different additives to the concrete were tested; the first block had no additive (supply ready-mix concrete), the second had ceramic chips added, the third copper slag, and the fourth a phase change material. The additives were to change the thermal properties of the blocks in a favorable way, either the quantity of energy stored or the rate at which energy was absorbed or released. No appreciable difference was found in the performance of the first three blocks; however, the phase change blocks showed a substantially greater heat capacity. It is concluded that concrete blocks for storage in connection with active solar systems do not seem to be economical or efficient, and that technical problems exist with encapulation of phase change materials in concrete.

18492 **(LA-UR—81-981) Thermal storage wall model development in the DOE-2 computer program.** Moore, J.E.; Schnurr, N.M.; Kerrisk, J.F.; Hunn, B.D. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 6p. (CONF-810509—25). NTIS, PC A02/MF A01.

From Annual conference of the International Solar Energy Society; Philadelphia, PA, USA (26 May 1981).

The DOE-2 building energy analysis computer program is being modified by the Los Alamos National Laboratory to include thermal storage wall modeling capabilities. This paper discusses model development and validation for vented and unvented thermal storage walls and water walls in DOE-2. The unvented wall model was validated by comparison with test-cell heating loads for both a selective surface and a night-insulated wall. The two commonly used vented wall models, the Akbari and Borgers correlations and the Bernoulli equation algorithm, were compared and tested against available wall performance data. The Bernoulli algorithm was chosen for use in DOE-2 because of its ability to simulate vent restrictions.

18493 (SOLAR/0005—81/36, pp 12p, Paper 2) **Comparison of liquid solar thermal storage subsystems in the National Solar Data Network.** 1980. NTIS PC A06/MF A01.

In National Solar Data Program performance results.

A performance comparison of liquid solar thermal storage subsystems is presented. Three systems selected for comparison are currently being monitored by the National Solar Data Network. For each system, effects of stratification, storage configuration, and environment is analyzed. Representative load profiles are presented for use in future simulation studies. Assumptions in current modeling trends are examined and evaluated.

18494 **PCM-crete energy storage and building element.** Mumma, S.A.; Liu, T.C. (Arizona State Univ., Tempe). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 243-246(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The objective of the research project was the production of a material combining the high thermal conductivity of concrete with the high thermal energy storage capacity of paraffin wax. The following points are discussed; location of a suitable paraffin wax, method of preparation of the composition material, evaluation of materials, and different ratios of mixture, and thermal characteristics of composite materials. The results show that it is possible to manufacture a concrete paraffin composite material with up to 40% by volume paraffin content. A marked increase in the apparent specific heat of the composite material over its pure concrete counterpart is easily obtained.

18495 **Performance comparison of domestic solar heating system using saturated ground soil storage as an alternative to water, rocks, and Glauber's salt.** Puri, V.M.; Okos, M.R. (Purdue Univ., West Lafayette, IN). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 251-256(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A three dimension, finite difference, unsteady-state heat transfer model has been developed to simulate heat transfer to and from air passing through pipes buried in sealed, water saturated ground soil. This was used to study the heat transfer characteristics of ground soil as a heat storage medium. In addition, heat storage simulation models for rocks, water and Glauber's salt proposed by other researchers have been used to compare their heat transfer performance with saturated ground soil. Furthermore, life cycle

cost comparisons of domestic solar systems with different types of storage materials, namely, water, rocks, Glauber's salt, and saturated ground soil, are included. Total heat capacity of the storage unit is considered a parameter in this study. Cost analysis indicates that saturated ground soil is more expensive than water, but cheaper than rocks and Glauber's salt.

18496 **Spherical probe method for determining the thermal properties of the earth.** Gillispie, W.W. Sr. (Dept. of Physics, Corpus Christi, TX); Hewett, L.D. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 256-260(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

One of the main obstacles in using the earth itself for large volume solar energy storage is the difficulty of determinging the thermal properties of the soil at specific sites. A fast and inexpensive method of accomplishing this task by utilizing the transient solutions to the heat flow equation surrounding a hollow spherical heat source buried in the ground to be tested is described. The temperature in the earth at a known distance from the source is monitored as a function of time and compared with various solutions to the heat equation. That solution which most closely matches the monitored data specifies the thermal conductivity and diffusivity of the soil surrounding the source.

18497 **Design of space heating systems employing seasonal sensible storage.** Braun, J.E.; Duffie, J.A. (Univ. of Wisconsin, Madison). *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 276-280(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

The design of solar heating systems employing short-term sensible storage has received considerable attention. Much less information is available on methodologies for the design of seasonal storage systems. The design of solar space heating systems employing seasonal sensible water storage is discussed. The effects of storage volume on system performance are investigated using TRNSYS. These simulation results lead to the development of a design method which is applicable for storage capacities ranging from a few days to seasonal storage. Also studied are the importance of the load heat exchanger size, tank insulation, collector slope, and year-to-year weather variations in the design of seasonal storage systems.

15 GEOTHERMAL ENERGY

1501 Resource Status And Assessment

18498 **(NP—25367) Comprehensive planning for the development of geothermal energy in Las Cruces and Dona Ana County, New Mexico. Final report, January 1-December 3, 1980.** Starkey, A.H.; Gebhard, T.G. (New Mexico State Univ., Las Cruces (USA). New Mexico Energy Inst.). Mar 1981. 208p. (EMD—2-68-2203). New Mexico Energy and Minerals Department, Sante Fe.

The key commercialization projects components are described: creation of a charter, a policy committee, use of technical expertise, the staff role and the formed adoption of policy recommendations, and their interrelationships. A technical state-of-the-art report for geothermal resources in Dona Ana County is presented including a geothermal evaluation and an environmental impact assessment. (MHR)

1503 Geothermal Exploration And Exploration Technology

18499 **(DOE/ET/28416—2) Preliminary targeting of geothermal resources in Delaware. Progress report, July 15, 1979-May 30, 1980.** Woodruff, K.D. (Delaware Geological Survey, Newark (USA)). Aug 1980. Contract AS02-78ET28416. 24p. NTIS, PC A02/MF A01.

Work completed included additional gravity mapping in southern Delaware, development of a computer program for contouring gravity data, and some preliminary quantitative interpretations of gravity and magnetic data in southern Delaware. No significant changes were made in the original Bouguer gravity map produced during the original contract period as a result of this later mapping. The SYMAP and SCONTOUR computing programs, developed by Harvard Graphics and adapted for the B7700, were used to generate computer drawn Bouguer gravity maps for the study area. Maximum depths calculated for the top of a gravity anomaly in the Bridgeville area ranged from about 2.3 to 2.7 kilometers (7500 to 8000 feet). Depth to magnetic basement in the same general area was calculated to be between about 1.5 and 2.9 kilometers (4920 and 6200 feet). Both gravity and magnetic data agree with trends noted on regional maps and suggest that in selected cases fracture zones beneath the coastal plain might be a possible target for future geothermal exploration.

18500 **(EPRI-TC—80-907, pp 4.16-4.23) Hawaii's geothermal development.** Uemura, R.T. (Hawaiian Electric Co., Inc. Honolulu). Dec 1980. NTIS, PC A13/MF A01.

From EPRI geothermal workshop; Monterey, CA, USA (23 Jun 1980).

The HGP-A well was drilled to a depth of 6,450 feet and the temperature at the bottom of the hole was measured at 676°F. The design of a 3 MW geothermal power plant was discussed taking the following into consideration: risk of volcanic eruption, environmental impact, and plant operation. Other topics included: the repair of HGP-A well, the well flow test, and the future of geothermal development in Hawaii. (MHR)

18501 **(LA—8766-MS) Application of fluid-chemistry studies to a hot-dry-rock geothermal system: I. Neutron-activation studies.** Vidale, R.; Binder, I.; Gancarz, A. (Los Alamos Scientific Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 25p. NTIS, PC A02/MF A01.

Neutron activation analysis methods were developed for determination of element concentrations in geothermal system waters, bulk rock samples, separated mineral phases, and intergranular salts from a hot dry rock geothermal system. Selected trace and major element concentrations were determined by neutron activation for: (1) 39 water samples taken during the course of a 75 day experimental run of the Fenton Hill hot dry rock system, including both the injected cool water (including makeup water) and the heated water emerging from the system; (2) a bulk rock core section from 8904 ft. (2714 m); (3) each of the 7 major mineral phases present in the rock; and (4) a sample of intergranular salts obtained by leaching the disaggregated rock at 25°C.

18502 **(LA—8778-MS) Applications of geothermal well log data for evaluation of reservoir potential.** Rigby, F.A. (Los Alamos Scientific Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 71p. NTIS, PC A04/MF A01.

A great many geothermal reservoirs are naturally fractured stems with porosity supplied by both the macroscopic fracture system and by dispersed intergranular or vuggy porosity. Flow properties, the use of log data for well test interpretation in such systems, and the log derivable parameters that may be of most value for evaluation are discussed here. Parameters for describing behavior of two-phase geothermal systems are also mentioned. Determination of reservoir dimensions is another important problem aggravated in geothermal resource evaluation by our limited knowledge of the geophysics of geothermal systems. The use of resistivity log data to deduce constraints on the inversion of surface resistivity data is examined. Potentially valuable applications of resistivity log data in deducing reservoir dimensions and reaching decisions on exploratory drilling are indicated.

1504 Legal And Institutional Aspects

18503 **(DOE/SF/01795—T1) State government workshop on barriers and incentives of geothermal energy resources. Quarterly report, November 1, 1978-January 31, 1979.** Harris, R.C. (National Conference of State Legislatures, Denver, CO (USA)). Feb 1979. Contract FG03-78SF01795. 248p. (SAN—1795-4). NTIS, PC A11/MF A01.

The National Conference of State Legislatures' Geothermal Policy Project concentrated its efforts in working directly with project states. The most important area of state activity was con-

ducting six workshops and meetings in three project states. Their overall objective was to develop legislative recommendations for introduction in 1979 legislative sessions. In addition, the project concentrated its efforts on preparing various materials for the policy review process in project states. Particular emphasis was placed on preparing background reports for legislative committees that highlighted legislative options and recommendations in policy areas where problems had been identified.

18504 **Final environmental impact statement. Geothermal leasing and development, Gifford Pinchot National Forest.** Washington, DC; Department of Agriculture (1979). 412p. (USDA-FS-R6-FES(ADM)—79-1). Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC. (MF or HC) Order No. 79-0765.

Leasing of lands for exploitation of geothermal resources in the Gifford Pinchot National Forest in Skamania and Cowlitz counties, Washington is proposed. The lands are in a 299,608-acre study area that is primarily within an area of noncompetitive geothermal lease applications; a Known Geothermal Resource Area (KGRA) would be leased through a competitive bidding process. The recommended alternative would make available for leasing 192,310 acres, including portions of four inventoried roadless areas. Leasing of 107,298 acres would be denied. Of the lands approved for leasing 86,784 acres would be subject to surface occupancy constraints. Existing control measures would be augmented by stipulations, and leasing of roadless areas would be delayed pending a decision on their management. Development of the proposed lease areas would contribute to the utiliztion of the nation's geothermal resources and the fulfillment of regional energy requirements. Socio-economic conditions in the area would be improved through the provision of additional employment, competitive electric power, and increased state and county tax revenues and royalty payments to the Federal Government. The Forest Service road system would be improved by lease operators. The proposed activities would add to subsidence, soil erosion, mass failures, and possibly earthquakes or volcanoes. Air quality would be degraded by noxious geothermal gases, dust, and vehicle and equipment emissions. Construction of roads, well drill pads, and pipeline and transmission corridors would destroy vegetation, displace wildlife, and reduce recreation and wilderness areas. Development activities would encroach on the habitat of the endangered bald eagle and critical elk and deer winter range and also would contaminate groundwater and increase fire risk and public safety hazards.

1505 Economic And Financial Aspects

18505 **(P—800-80-002) Decision on the Northern California Power Agency's application for certification for Geothermal Project No. 2.** (California Energy Commission, Sacramento (USA)). Feb 1980. 142p. California Energy Commission, Sacramento.

Findings on compliance with statutory site certification requirements, a discussion of the Joint Environmental Study and its significance in terms of the California Environmental Quality and National Environmental Policy Acts, a brief recapitulation of the procedural steps which occured, and a summary of the evidentiary bases for this Decision are included. Topical discussions on the various human and natural environmental areas impacted by the project, as well as the technical, engineering, and other areas of concern affected by the project are presented. These topical discussions summarize the basis for the Commission's ultimate Findings and Conclusions pertaining to each broad category.

1506 Environmental Aspects And Waste Disposal

REFER ALSO TO CITATION(S) 18498, 18504, 18505

18506 (EPRI-TC—80-907, pp 2.4-2.10) **Environmental considerations for a geothermal development in the Jemez Mountains of central NM.** Sabo, D.G. (Public Service Co., Albuquerque, NM). Dec 1980. NTIS, PC A13/MF A01.

From EPRI geothermal workshop; Monterey, CA, USA (23 Jun 1980).

The following phases of the environmental monitoring program are described: air quality/meteoroology, water quality monitoring, hydrology, aquatic ecology, and terrestrial ecology. Equipment and procedures are listed. (MHR)

18507 **(UCRL—15343) Salton Sea sampling program: baseline studies.** Tullis, R.E.; Carter, J.L.; Langlois, G.W. (California State Univ., Hayward (USA). Dept. of Biological Sciences). 13 Apr 1981. Contract W-7405-ENG-48. 32p. NTIS, PC A03/MF A01.

Baseline data are provided on three species of fish from the Salton Sea, California. The fishes considered were the orange mouth corvina (Cynoscion xanthulus), gulf croaker (Bairdiella icistius) and sargo (Anisotremus davidsonii). Morphometric and meristic data are presented as a baseline to aid in the evaluation of any physiological stress the fish may experience as a result of geothermal development. Analyses were made on muscle, liver, and bone of the fishes sampled to provide baseline data on elemental tissue burdens. The elements measured were: As, Br, Ca, Cu, Fe, Ga, K, Mn, Mi, Pb, Rb, Se, Sr, Zn, and Zr. These data are important if an environmentally sound progression of geothermal power production is to occur at the Salton Sea.

1508 Geothermal Power Plants

REFER ALSO TO CITATION(S) 18500, 18505, 18506, 18806

18508 **(EPRI-TC—80-907) Proceedings of the fourth annual geothermal conference and workshop.** (Altas Corp., Santa Cruz, CA (USA)). Dec 1980. 284p. (CONF-800681—). NTIS, PC A13/MF A01.

From EPRI geothermal workshop; Monterey, CA, USA (23 Jun 1980).

Thirty-eight papers are included. One was indexed previously for EDB. Separate abstracts were prepared for thirty-three papers and two were listed by title. Reports of two workshop discussion groups on Achieving Technical Performance and Obtaining a License and Protecting the Environment were not abstracted for EDB. (MHR)

18509 (EPRI-TC—80-907, pp 2.1-2.3) **BACA geothermal demonstration power plant project. Special report.** Maddox, J.D. (Public Service Co., Albuquerque, NM). Dec 1980. NTIS, PC A13/MF A01.

From EPRI geothermal workshop; Monterey, CA, USA (23 Jun 1980).

The project objectives are listed and the project organization and work breakdown structure are shown in charts. (MHR)

18510 (EPRI-TC—80-907, pp 2.24-2.25) **Baca data dissemination program.** Sherwood, P.B. (WESTEC Services, Inc., Albuquerque, NM); Marquis, M.A. Dec 1980. NTIS, PC A13/MF A01.

From EPRI geothermal workshop; Monterey, CA, USA (23 Jun 1980).

All technical data from the Project and most routine interpretation of technical data will be available for dissemination without restriction. However, any computer programs, proprietary interpretive methods, correlations derived from operations outside the Project, and information regarding contractual relationships will generally not be made available for dissemination. The following categories of data are anticipated to be made available from this Project: financial, legal/licensing/ permitting, environmental monitoring, exploration data, and resource development/production data. (MHR)

18511 (EPRI-TC—80-907, pp 7.7-7.12) **Ahuachapan geothermal power plant, El Salvador.** DiPippo, R. (Southeastern Massachusetts Univ., North Dartmouth). Dec 1980. NTIS, PC A13/MF A01.

From EPRI geothermal workshop; Monterey, CA, USA (23 Jun 1980).

El Salvador is the first of the Cntral American countries to construct and operate a geothermal electric generating station. Exploration began in the mid-1960's at the geothermal field near Ahuachapan in western El Salvador. The first power unit, a separated-steam or so-called single-flash plant, was started up in June

1975, and was followed a year later by an identical unit. In July 1980, the Comision Ejecutiva Hidroelectrica del Rio Lempa (C.E.L.) will complete the installation of a third unit, a dual-pressure (or double-flash) unit rated at 35 MW. The full Ahuachapan plant will then constitute about 20% of the total installed electric generating capacity of the country. During 1977, the first two units generated nearly one-third of all the electricity produced in El Salvador.

18512 (EPRI-TC—80-907, pp 7.63-7.67) **Worldwide geothermal power plants: status as of June 1980.** DiPippo, R. (Southeastern Massachusetts Univ., North Dartmouth). Dec 1980. NTIS, PC A13/MF A01.

From EPRI geothermal workshop; Monterey, CA, USA (23 Jun 1980).

There are 100 geothermal power units now in operation throughout 12 countries, with a total installed capacity of just over 2110 MW. The average unit thus is rated at 21.1 MW. Newer units may be broadly classified as follows: (a) wellhead units of less than 5 MW; (b) small plants of about 10 MW; (c) medium plants of 30 to 35 MW; (d) large plants of about 55 MW; and (e) complexes typically consisting of several 55 MW units in a large geothermal field. There is a trend toward turbine units of the double-flow type with a 55 MW rating, used either alone or in a tandem-compound arrangement giving 110 MW in a single power house. This is particularly evident at The Geysers field in California. Double-flash units (separated-steam followed by a surface flash) are suited to high quality reservoirs having high temperature, high steam fractions at the wellhead, and low scaling potential. Single-flash units (separated steam) may be called for where scaling by the spent brine is a potential problem for the liquid disposal system. Binary plants are being used for some very low temperature reservoirs, particularly in the People's Republic of China, albeit in extremely small units. A large-scale pilot plant of the binary type is being planned for the Imperial Valley of California.

18513 **(PNL—3419) Cost benefits from applying advanced heat rejection concepts to a wet/dry-cooled binary geothermal plant.** Faletti, D.W. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Mar 1981. Contract AC06-76RL01830. 56p. NTIS, PC A04/MF A01.

Optimized ammonia heat rejection system designs were carried out for three water allocations equivalent to 9, 20, and 31% of that of a 100% wet-cooled plant. The Holt/Procon design of a 50-MWe binary geothermal plant for the Heber site was used as a design basis. The optimization process took into account the penalties for replacement power, gas turbine capital, and lost capacity due to increased heat rejection temperature, as well as added base plant capacity and fuel to provide fan and pump power to the heat rejection system. Descriptions of the three plant designs are presented. For comparison, a wet tower loop was costed out for a 100% wet-cooled plant using the parameters of the Holt/Procon design. Wet/dry cooling was found to increase the cost of electricity by 28% above that of a 100% wet-cooled plant for all three of the water allocations studied (9, 20, and 31%). The application selected for a preconceptual evaluation of the BCT (binary cooling tower) system was the use of agricultural waste water from the New River, located in California's Imperial Valley, to cool a 50-MWe binary geothermal plant. Technical and cost evaluations at the preconceptual level indicated that performance estimates provided by Tower Systems Incorporated (TSI) were reasonable and that TSI's tower cost, although 2 to 19% lower than PNL estimates, was also reasonable. Electrical cost comparisonswere made among the BCT system, a conventional 100% wet system, and a 9% wet/dry ammonia system, all using agricultural waste water with solar pond disposal. The BCT system cost the least, yielding a cost of electricity only 13% above that of a conventional wet system using high quality water and 14% less than either the conventional 100% wet or the 9% wet/dry ammonia system.

1509 Geothermal Engineering

REFER ALSO TO CITATION(S) 18521

18514 **(SAND—79-7129) State-of-the-art of drilling thrusters.** Dareing, D.W. (Maurer Engineering, Inc., Houston, TX (USA)). Jan 1980. Contract AC04-76DP00789. 153p. NTIS, PC A08/MF A01.

Several different concepts for applying force or thrust to drill bits are identified. Recommendations for further studies of drilling thrusters are made.

18515 **(SAND—80-2000) User manual for IOSYM: an input-oriented simulation language for continuous systems.** Polito, J. (Sandia National Labs., Albuquerque, NM (USA)). Mar 1981. Contract AC04-76DP00789. 161p. NTIS, PC A08/MF A01.

IOSYM is an extension of the GASP IV simulation language. It permits systems which are sequences of continuous processes to be modeled graphically. Normally the system can be described by data input only. The language permits stochastic sequencing and termination criteria for processes and allows crossing conditions for ending operations that are more general than GASP IV. Extensive capability exists for conditional branching and logical modification of the network. IOSYM has been used to model the cost of geothermal drilling where the various costly processes of drilling are represented by IOSYM operations. The language is much more general, however, since it retains most of GASP IV's discrete event capabilities and permits easy modeling of continuous processes.

18516 **(SAND—80-2651) Magma simulation facility design considerations, capabilities, and operational considerations.** Wemple, R.P. (Sandia National Labs., Albuquerque, NM (USA)). Apr 1981. Contract AC04-76DP00789. 36p. NTIS, PC A03/MF A01.

The high-pressure, high temperature (60 Kpsi or 413.6 MPa/1600°C) facility described is being used for molten rock (magma) experiments and metallurgical pressure bonding experiments. The unique design of the facility will accommodate samples as large as 10 cm dia. by 10 cm in height in an isothermal (+-4°C at 1400°C and 44 Kpsi or 303.3 MPa) cylindrical hot zone. The facility history, capabilities, and operational considerations are thoroughly discussed with appropriate illustrations. Since the system-contained energy while operating is approximately 1 x 10^6 ft-lbs (1.356 x 10^6 N-m) or 0.7 lbs (318 g) TNT equivalent, considerable discussion is related to hazards analysis and protection of the equipment and the operating personnel from damage caused by nonstandard conditions (interrupted H_2O flow, power outage, overpressure, etc.).

18517 **(SAND—80-7110) Program for the improvement of downhole drilling motor bearings and seals. Phase IV. Semi-annual report.** Tibbitts, G.A.; DeLafosse, P.H.; Black, A.; Green, S.J. (Terra Tek, Inc., Salt Lake City, UT (USA)). Jul 1980. Contract AC04-76DP00789. 81p. NTIS, PC A05/MF A01.

Four main areas of development for the project are covered: design and fabrication of a dynamometer and a mud cooling system for the Bearing-Seal Package Test Facility; modification of the Bearing-Seal Package Test Facility based on test results; testing of new lubricant samples from Pacer Lubricants, Inc., in the Terra Tek High Temperature Lubricant Tester; and testing of new seal types in the Terra Tek Sea Tester. The Maurer Engineering Report, Semi-Annual Progress Report on Improvement of Downhole Motor Bearings and Seals by Jeff L. Barnwell, has been included as Appendix B.

18518 **(SAND—81-0241) Thermal analysis of pseudo-steady circulating wellbores.** Cline, D.D. (Sandia National Labs., Albuquerque, NM (USA)). Mar 1981. Contract AC04-76DP00789. 82p. NTIS, PC A05/MF A01.

A mathematical model for the fluid temperature distribution inside a wellbore undergoing circulation is developed. The formulation assumes that the heat transfer processes between the formation and the circulating fluid in the wellbore occur in a pseudo-steady manner. A closed form solution to the counterflow energy equations is developed in a manner which allows for arbitrary temperature distributions in the formation. Results are presented for both

linear as well as bilinear formation temperatures. It is concluded that the outlet fluid temperature is a nonunique function of the geothermal gradient. In addition, for a specified wellbore configuration, an optimum set of circulation conditions may be identified for which the outlet fluid temperature is a maximum for a given inlet fluid temperature.

18519 **(SAND—81-0381) Geothermal Drilling and Completion Technology Development Program. Quarterly progress report, October 1980-December 1980.** Kelsey, J.R. (ed.). (Sandia National Labs., Albuquerque, NM (USA)). Mar 1981. Contract AC04-76DP00789. 268p. NTIS, PC A13/MF A01.

The progress, status, and results of ongoing Research and Development (R and D) within the Geothermal Drilling and Completion Technology Development Program are described. The program emphasizes the development of geothermal drilling hardware, drilling fluids, completion technology, and lost circulation control methods. Advanced drilling systems are also under development.

18520 **(UCRL—52756) Evaluation of reservoir properties in a portion of the Salton Sea Geothermal Field.** Morse, J.G.; Stone, R. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 4 Apr 1979. Contract W-7405-ENG-48. 56p. NTIS, PC A04/MF A01.

A series of pressure-transient tests was performed using several geothermal wells in the southwestern portion of the Salton Sea Geothermal Field in the Imperial Valley, California. The objective of the tests was to evaluate the permeability and storage capacity of the geothermal reservoir. Measurement of pressure transients in the corrosive, high-temperature environment of geothermal wells was made possible by modifying commercially available instrumentation and fabrication of pressure-sensing devices from very corrosion-resistant material. Analysis of pressure-transient data associated with production from and injection into the geothermal reservoir provides estimates of reservoir permeability that vary from 70 to 1000 md, with most of the values in the range from 70 to 220 md. A reservoir porosity-compressibility product of 2.8×10^{-6} psi^{-1} was derived. The pressure responses to the tests appear to be characteristic of a confined, nonleaky reservoir. The vertical permeability of a 40-ft-thick shale layer within the reservoir was estimated to be between 0.1 and 1 md. No lateral positive or negative hydraulic boundaries were detected. The pressure response of the primary spent-brine injection well was indicative of combined fracture and matrix flow in the reservoir. This well's lifetime with no brine treatment prior to injection would be about 150 days at an injection flow rate of 600 gpm; simply cycling the brine through settling tanks prior to injection would increase the well's useful life to about two years at the same injection rate.

1520 Geothermal Data And Theory

REFER ALSO TO CITATION(S) 19392

18521 **(LA-UR—81-534) Experimentally determined rock-fluid interactions applicable to a natural hot-dry-rock geothermal system.** Charles, R.W.; Grigsby, C.O.; Holley, C.E. Jr.; Tester, J.W.; Blatz, L.A. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-EBG-36. 25p. (CONF-810618—1). NTIS, PC A02/MF A01.

From AIME conference on process mineralogy in extractive metallurgy; Johannesburg, South Africa (Jun 1981).

The field program cnsists of experiments in which hot rock of low permeability is hydraulically fractured between two wellbores. Water is circulated from one well to the other through the fractured hot rock. Our field experiments are designed to test reservoir engineering parameters such as heat-extraction rates, water-loss rates, flow characteristics including impedance and buoyancy, seismic activity, and fluid chemistry. Laboratory experiments were designed to provide information on the mineral-water reactivity encountered during the field program. Two experimental circulation systems tested the rates of dissolution and alteration during dynamic flow. Solubility of rock in agitated systems was studied. Moreover, pure minerals, samples of the granodiorite from the actual reservoir, and Tijeras Canyon granite have been reacted with distilled water and various solutions of NaCl, NaOH, and Na_2CO_3. The results of these experimental systems are compared to the observations made in field experiments done within the hot dry rock reservoir at a depth of approximately 3 km where the initial rock temperature was 150 to 200°C.

16 TIDAL POWER

1605 Environmental Aspects

REFER ALSO TO CITATION(S) 18523

1607 Tidal Power Plants

18522 (CONF-791056—, pp 550-559) **Annapolis tidal power pilot project.** Baker, G.C.; Wilson, E.M.; Miller, H.; Gibson, R.A.; Balls, M. 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

Annual energy production calculations are presented for a proposed tidal power station at Annapolis Royal, Nova Scotia. The station would utilize an existing barrier across the Annapolis River and consist of one 17.8 MW straight-flow turbine with rim generator. (HDR)

18523 **(DOE/ID/12089—T1) Half Moon Cove Tidal Project. Feasibility report.** (Main (Charles T.), Inc., Boston, MA (USA)). Nov 1980. Contract FC07-80ID12089. 136p. NTIS, PC A07/MF A01.

The proposed Half Moon Cove Tidal Power Project would be located in a small cove in the northern part of Cobscook Bay in the vicinity of Eastport, Maine. The project would be the first tidal electric power generating plant in the United States of America. The basin impounded by the barrier when full will approximate 1.2 square miles. The average tidal range at Eastport is 18.2 feet. The maximum spring tidal range will be 26.2 feet and the neap tidal range 12.8 feet. The project will be of the single pool-type single effect in which generation takes place on the ebb tide only. Utilizing an average mean tidal range of 18.2 feet the mode of operation enables generation for approximately ten and one-half (10-1/2) hours per day or slightly in excess of five (5) hours per tide. The installed capacity will be 12 MW utilizing 2 to 6 MW units. An axial flow, or Bulb type of turbine was selected for this study.

17 WIND ENERGY

1701 Availability (climatology)

REFER ALSO TO CITATION(S) 18249

18524 **(PNL—3195-WERA-6) Wind energy resource atlas: Volume 6. The Southeast region.** Zabransky, J.; Vilardo, J.M.; Schakenbach, J.T.; Elliott, D.L.; Barchet, W.R.; George, R.L. (Geomet Technologies, Inc., Gaithersburg, MD (USA)). Jan 1981. Contract AC06-76RL01830. 175p. NTIS, PC A08/MF A01.

The Southeast atlas assimilates six collections of wind resource data: one for the region and one for each of the five states that compose the Southeast region (Alabama, Florida, Georgia, Mississippi, and South Carolina). At the state level, features of the climate, topography and wind resource are discussed in greater detail than is provided in the regional discussion, and the data locations on which the assessment is based are mapped. Variations, over several time scales, in the wind resource at selected stations in each state are shown on graphs of monthly average and interannual wind speed and power, and hourly average wind speed for each season. Other graphs present speed, direction and duration frequencies of the wind at these locations.

18525 (PNL—3195-WERA-11) Wind Energy Resource Atlas. Volume 11. Hawaii and Pacific Islands Region. Schroeder, T.A.; Hori, A.M.; Elliott, D.L.; Barchet, W.R.; George, R.L. (Hawaii Univ., Honolulu (USA). Dept. of Meteorology). Feb 1981. Contract AC06-76RL01830. 127p. NTIS, PC A07/MF A01.

This atlas of the wind energy resource is composed of introductory and background information, and assessments of the wind resource in each division of the region. Background on how the wind resource is assessed and on how the results of the assessment should be inerpreted is presented. An introduction and outline to the descriptions of the wind resource for each division are provided. Assessments for individual divisions are presented as separate chapters. Much of the information in the division chapters is given in graphic or tabular form. The sequences for each chapter are similar, but some presentations used for Hawaii are inappropriate or impractical for presentation with the Pacific Islands. Hawaii chapter figure and tables are cited below and appropriate Pacific Islands figure and table numbers are included in brackets [].

1703 Regulations

REFER ALSO TO CITATION(S) 18252

1704 Economics

18526 (SERI/TR—98282-11) Near-term high potential counties for SWECS. Final report. Osborn, W.C.; Downey, W.T. (Little (Arthur D.), Inc., Cambridge, MA (USA)). Feb 1981. Contract AC02-77CH00178. 103p. NTIS, PC A06/MF A01.

The objective of this analysis is to aid wind energy equipment manufacturers and distributors by: identifying the rural counties in the United States with high SWECS market potential in terms of economic and demographic factors; providing county-level SWECS market information on wind speed, average utility rates, demographic data and state incentives; and presenting some equations which may be used to determine the cost to the customer of SWECS-supplied energy in a grid-connected application, where the customer can sell any excess SWECS produced electricity to the local utility. The report compiles and analyzes county level data indicative of the market potential for SWECS in rural residential and agricultural applications. Economic and demographic market indices are developed for both the residential and agricultural sectors, the four indices are computed for each county and a comparative ranking is performed for the 2474 rural counties. A relative comparison of county-level market potential is displayed on multi-colored maps of the United States.

18527 (SERI/TR—98282-11(App.)) Near-term high potential counties for SWECS. Final report. Osborn, W.C.; Downey, W.T. (Little (Arthur D.), Inc., Cambridge, MA (USA)). Feb 1981. Contract AC02-77CH00178. 506p. NTIS, PC A22/MF A01.

This Appendix provides by state and county the results and background data of the Near Term High-Potential Counties for SWECS. Because the Appendix is designed to be used apart from the report itself, it includes a brief summary of the methodology used to compare market potential. It also includes a guide to the state SWECS market data reports and some examples of how a SWECS manufacturer might use the data in market planning. Finally, the state reports are provided, presenting essential market information for every rural county in the country.

1705 Environmental Aspects

18528 (SERI/TP—744-1099) Land-use implications of wind-energy-conversion systems. Noun, R.J. (Solar Energy Research Inst., Golden, CO (USA)). Feb 1981. Contract AC02-77CH00178. 7p. (CONF-810447—1). NTIS, PC A02/MF A01.

From Wind power: energy alternative for the upper Midwest; Rochester, MN, USA (3 Apr 1981).

An estimated 20 utilities in the United States are now investigating potential wind machine sites in their areas. Identifying sites for wind machine clusters (wind farms) involves more than just finding a location with a suitable wind resource. Consideration must also be given to the proximity of sites to existing transmission lines, environmental impacts, aesthetics, and legal concerns as well as the availability of and alternative uses for the land. These issues have made it increasingly difficult for utilities to bring conventional power plants on-line quickly. Utilities are now required, however, to give careful consideration to specific legal, social, and environmental questions raised by the siting of wind energy conversion systems (WECS).

1706 Wind Energy Engineering

REFER ALSO TO CITATION(S) 18524, 18525

18529 (DOE/ET/23116—80/1) Analysis of strong nocturnal shears for wind machine design. Final report. Mahrt, L.; Heald, R.C. (Oregon State Univ., Corvallis (USA). Dept. of Atmospheric Science). Nov 1980. Contract AT06-79ET23116. 77p. (PNL—3781). NTIS, PC A05/MF A01.

Wind shear data at wind turbine heights from several sites is reviewed and new data is documented in terms of total and component shear. A variety of atmospheric scenarios may combine to give large persistent shear. Among these, strong boundary layer stability is foremost. It occurs with strong nocturnal surface cooling, in low level frontal and subsidence inversions, and in thunderstorm outflows. Strong shears resulting from surface radiation inversions are particularly evident over the High Plains where dry air and high altitude combine to result in strong radiational cooling. Terrain is also an important influence on shear but it is not well understood and is very site specific.

18530 (SAND—80-2114) Aerodynamic characteristics of seven symmetrical airfoil sections through 180-degree angle of attack for use in aerodynamic analysis of vertical axis wind turbines. Sheldahl, R.E.; Klimas, P.C. (Sandia National Labs., Albuquerque, NM (USA)). Mar 1981. Contract AC04-76DP00789. 120p. NTIS, PC A06/MF A01.

When work began on the Darrieus vertical axis wind turbine (VAWT) program at Sandia National Laboratories, it was recognized that there was a paucity of symmetrical airfoil data needed to describe the aerodynamics of turbine blades. Curved-bladed Darrieus turbines operate at local Reynolds numbers (Re) and angles of attack (α) seldom encountered in aeronautical applications. This report describes (1) a wind tunnel test series conducted at moderate values of Re in which $0 \leqq \alpha \leqq 180^0$ force and moment data were obtained for four symmetrical blade-candidate airfoil sections (NACA-0009, -0012, -0012H, and -0015), and (2) how an airfoil property synthesizer code can be used to extend the measured properties to arbitrary values of Re ($10^4 \leqq Re \leqq 10^7$) and to certain other section profiles (NACA-0018, -0021, -0025).

18531 (SAND—81-0896) Aerodynamic interference between two Darrieus wind turbines. Schatzle, P.R.; Klimas, P.C.; Spahr, H.R. (Sandia National Labs., Albuquerque, NM (USA)). Apr 1981. Contract AC04-76DP00789. 38p. NTIS, PC A03/MF A01.

The effect of aerodynamic interference on the performance of two curved bladed Darrieus-type vertical axis wind turbines has been calculated using a vortex/lifting line aerodynamic model. The turbines have a tower-to-tower separation distance of 1.5 turbine diameters, with the line of turbine centers varying with respect to the ambient wind direction. The effects of freestream turbulence were neglected. For the cases examined, the calculations showed that the downwind turbine power decrement (1) was significant only when the line of turbine centers was coincident with the ambient wind direction, (2) increased with increasing tipspeed ratio, and (3) is due more to induced flow angularities downstream than to speed deficits near the downstream turbine.

18532 Coupled rotor/tower aeroelastic analysis of large horizontal axis wind turbines. Warmbrodt, W.; Friedmann, P. (NASA, Ames Res Cent, Moffet Field, Calif). *AIAA (American Institute of Aeronautics and Astronautics) Journal ;* **18**: No. 9, 1118-1124(Sep 1980).

Formulation of the governing nonlinear equations of motion for the coupled rotor/tower dynamics of a large two-bladed horizontal axis wind turbine (HAWT) is presented. Each blade has elastic flap and lead-lag bending deflections and the supporting tower has bending-bending-torsion deflections. Rotor/tower coupling is accomplished by enforcing dynamic equilibrium between the rotor and the top of the tower. The nonlinear periodic coefficient equations of motion are used to study aeroelastic stability and response of the NASA/DOE 100 kW Mod-O wind turbine. The influence of the flexible tower and nonlinear terms on rotor stability is examined. Isolated rotor blade behavior is compared to the complete coupled rotor/tower system and the basic differences are identified. It is concluded that for high tower stiffness, the aeroelastic response is primarily dependent on isolated rotor forcing, yaw mechanism flexibility, and tower shadow effect. 23 refs.

18533 **Crosswind kite power.** Loyd, M.L. (Lawrence Livermore Lab., CA). *Journal of Energy ;* **4**: No. 3, 106-111(May-Jun 1980).

This paper describes a concept for large-scale wind power production by means of aerodynamically efficient kites. Based on aircraft construction, these kites fly transverse to the wind at high speed. The lift produced at this speed is sufficient to both support the kite and generate power. The equations of motion are developed, and examples are presented. One version, based on the C-5A aircraft, results in 6.7 MW produced by a 10-m/s wind. Extrapolation to newer technology, which is more comparable to modern wind turbines, indicates the production of 45 MW from a single machine. The detailed calculations are validated by comparison of their results with simple analytical models. The methodology used here lays the foundation for the systematic study of power-producing kites. 20 refs.

18534 **Design and fabrication of a composite wind turbine blade.** Brown, R.A. (Boeing Engineering and Construction, Seattle, WA); Haley, R.G. *SAMPE (Society for the Advancement of Material and Process Engineers) Journal ;* **12**: 1095-1103(1980). (CONF-801010—).

From 12. National Society for the Advancement of Materials and Process Engineering technical conference; Seattle, WA, USA (7 Oct 1980).

This paper describes the design considerations leading to the innovative combination of materials used for the MOD-I wind turbine generator rotor and the fabrication processes which were required to accomplish it.

20 ELECTRIC POWER ENGINEERING

2001 Power Plants And Power Generation

REFER ALSO TO CITATION(S) 18314, 18334, 18416, 18418, 18568, 18595, 18745, 18764, 18765, 18766, 18767, 18770, 18799, 18801, 18852, 18959, 19097

18535 (CONF-800483—(Vol.1), pp 113-118) **Design, stress analysis, and operating experience in feedwater heaters.** Singh, K.P. (Joseph Oat Corp., Camden, NJ); Libs, T. 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

The performance of feedwater heaters has a direct bearing on the thermal efficiency of the plant. A typical feedwater heater may have three distinct regions of heat transfer, namely: desuperheating, condensing, and subcooling zones. The design challenges attendant on successful heat transfer in each zone are summarized. Deficiencies in the current design codes and standards are also discussed. In addition to focusing attention on the state-of-the art technology deficiencies, some remedial measures for improved design are offered. A synopsis of the most-commonly-reported operating problems is given. A diagnosis of the troubles is also presented to aid a prospective designer or user in avoiding a repetition of past mistakes.

18536 **(DOE/ET/10348—T1) High temperature turbine technology program. Phase II. Technology test and support studies. Annual technical progress report, January 1, 1979-December 31, 1979.** (Curtiss-Wright Corp., Wood-Ridge, NJ (USA). Power Systems Div.). Jan 1980. Contract AC01-76ET10348. 323p. (FE—2291-62; CW-WR—76-020.62). NTIS, PC A14/MF A01.

Work performed on the High Temperature Turbine Technology Program, Phase II - Technology Test and Support Studies during the period from January 1, 1979 through December 31, 1979 is summarized. Objectives of the program elements as well as technical progress and problems encountered during this Phase II annual reporting period are presented. Progress on design, fabrication and checkout of test facilities and test rigs is described. LP turbine cascade tests were concluded. 350 hours of testing were conducted on the LP rig engine first with clean distillate fuel and then with fly ash particulates injected into the hot gas stream. Design and fabrication of the turbine spool technology rig components are described. TSTR 60° sector combustor rig fabrication and testing are reviewed. Progress in the design and fabrication of TSTR cascade rig components for operation on both distillate fuel and low Btu gas is described. The new coal-derived gaseous fuel synthesizing facility is reviewed. Results and future plans for the supporting metallurgical programs are discussed.

18537 **(DOE/IR/05106—T40) Columbus refuse/coal fired generating plant.** (Public Technology, Inc., Washington, DC (USA)). May 1980. Contract FG02-78IR05106. 2p. NTIS, PC A02/MF A01.

The 90 MW power plant under construction in Columbus, Ohio is described. This plant is designed to burn, on a heat input basis, 80% shredded refuse and 20% coal, and is expected to save the equivalent of 150,000 tons of coal per year. Supported by a public referendum, this city-owned plant is also projected to save the city 2.5 million dollars per year in electric power costs. The facility should be completed by mid-1982. (LCL)

18538 **(DOE/NASA/1062—8) Thermionic energy conversion (TEC) topping thermoelectrics.** Morris, J.F. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1981. Contract AI01-77ET13111. 17p. (NASA-TM—81677; CONF-810527—1). NTIS, PC A02/MF A01.

From International conference on plasma science; Sante Fe, NM, USA (18 May 1981).

Long-respected international experts on thermoelectrics (Dixon, Ertl and Goldsmid supported by Ure) determine the probable maximum figure of merit (ZT) for fully matured thermoelectric generators as about unity from ordiary temperatures to 2000 K. Thus the maximum efficiency for fully matured thermoelectrics would be approximately 0.414 (1 - r/sub T/)/(1.414 + r/sub T/) where r/sub T/ is the ratio of cold and hot junction temperatures. This limitation contrasts with the recent burst of enthusiasm for high-temperature thermoelectrics - based on calculated figures of merit and efficiencies that increase more and more rapidly with rising temperatures. Unfortunately these calculations neglect internal radiation effects which diminish thermoelectric figures of merit significantly at 1000 K and substantially at 2000 K: The effective thermal-conductivity contribution of intrathermoelectric radiative dissipation increases with the third power of temperature. Therefore the quotation from Thermoelectricy: Science and Engineering by Heikes and Ure apparently still prevails: ...thermoelectric devices appear difficult to extend in the direction of high temperature, while thermionic devices become inefficient at low temperature. Accordingly consideration of thermoelectric power generation with high-temperature heat sources should include utilization of TEC topping thermoelectrics. However TEC alone or TEC topping more-efficient conversion systems like steam or gas turbines, combined cycles or Stirling engines would be more desirable generally.

18539 **(DOE/PC/30218—T1) Scaled-bed modeling for fluidized-bed combustors. Semi-annual report, October 1, 1980-March 31, 1981.** Fitzgerald, T.J.; Crane, S.D. (Oregon State Univ., Corvallis (USA). Dept. of Chemical Engineering). Mar 1981. Contract FG22-80PC30218. 11p. NTIS, PC A02/MF A01.

Progress is reported in developing scaled models of coal-fired fluidized-bed combustors which can be used with confidence to obtain performance data for predicting the performance of full scale units. Construction of two 1/4 scale atmospheric pressure fluidized bed combustors is nearing completion. (LCL)

18540 (DOE/SF/10538—T8(Vol.2), pp 124-166) **Gas turbines.** Mar 1981. NTIS, PC A08/MF A01.

In Studies on advanced overseas energy technologies. Volume II. Final report.

A state of the art of gas turbine technology in Sweden, Japan, Switzerland, Norway, and Federal Republic of Germany is presented.

18541 **(EPRI-CS—1665(Pts.1-2)) Investigation of numerical modeling techniques for recirculating flows. Parts 1 and 2. Final report, February 1981.** (Envirodyne Ltd., Waterloo, Ontario (Canada)). Feb 1981. 254p. NTIS, PC A12/MF A01.

The successful computational solution of complex shear flows of physical interest will require advances from the present state-of-the-art in both numerical (computational) techniques and physical modeling of the transport process. The first part of this report reviews aspects of physical models given in the literature which may be appropriate, in the sense of their extendability, as a basis of models for complex turbulent flows in which buoyancy generation of turbulence and flow curvature are prevalent. A particular model is proposed for the specific case where the fairly thin shear layer approximations are imposed and where local curvature is constant. In addition a Richardson number is proposed for flows in which both curvature and buoyancy are dominant factors of flow stabilization. The second part discusses the properties and sizes of the equation sets that arise in typical problems of practical interest. State-of-the-art methods of treating inter-equation coupling are then discussed, the convergence characteristics of several methods which appear to be the most economically attractive are illustrated, and a study of the relative economics of the promising methods is described.

18542 **(NP—25352) Electric Utility Rate Design Study: embedded generation costs on a time-of-day basis for Iowa Southern Utilities Company.** (Ernst and Whinney, Washington, DC (USA)). 19 May 1980. 97p. EPRI, Palo Alto, CA.

A method is developed for determining these costs are not allocated to customer classes. Since average embedded costs are composed of the running (or variable) costs and the capital costs, the analysis examines each of these separately. Running costs on a time-of-day basis are determined through the use of a generation-dispatch model that reports the loadings by generating unit and the running costs of meeting the load. These costs are reported on an hour-by-hour basis. The dispatch model takes into account the operating characteristics of each unit and the major engineering constraints on a system; e.g., must-run units, minimum up-and-down time, startup costs. After reviewing several suggested capital-cost-allocation procedures, a method is developed that allocates capital costs on a time-of-day basis by using a recontracting for capacity procedure that allows capacity to vary by hour for each month. The method results in allocations to customers who benefit from its use.

18543 **Performance of a plate fin air-cooled heat exchanger with deluged water augmentation.** Kreid, D.K.; Parry, H.L.; McGowan, L.J.; Johnson, B.M. (Pac Northwest Lab, Richland, Wash). *American Society of Mechanical Engineers, [Paper] ;* No. 79-WA/Ener-1, vp(2 Dec 1979).

An experimental program has been carried out to evaluate the performance of a plate fin air-cooled heat exchanger that has air-side surfaces deluged with a flow of water. Deluge augmentation of this type has been proposed for improving the performance of dry cooling towers. Laboratory tests were performed parametrically on a section of core to investigate the effects of the inlet meteorological conditions and operating conditions. Test results indicate deluged heat transfer rates from 1.4 to 7 times greater than non-deluged rates under comparable conditions. The enhancement ratio is strongly affected by initial temperature difference and air humidity. The results of the tests are compared with predictions of deluge heat transfer derived from an aproximate theory based on an enthalpy driving potential. 12 refs.

2002 Environmental Aspects

REFER ALSO TO CITATION(S) 17936, 17941, 18757, 19198, 19374, 19376

18544 (DOE/SF/10538—T8(Vol.2), pp 199-246) **Pollution control.** Mar 1981. NTIS, PC A08/MF A01.

In Studies on advanced overseas energy technologies. Volume II. Final report.

Overseas investigations centering largely on coal-fired electrical plants, diesel SO/sub x//No/sub x/ reduction, and dry coke quenching are presented. Some pollution control technologies are included for Japan, France, Sweden, Austria, Australia, and Federal Republic of Germany. (MCW)

18545 **(EPRI-EA—1749) Methodology for assessing population and ecosystem level effects related to intake of cooling waters: methodology application to Cayuga Lake. Final report.** Alevras, R.A.; Logan, D.T.; Dew, C.B. (Lawler, Matusky and Skelly, Pearl River, NY (USA)). Apr 1981. 134p. NTIS, PC A07/MF A01.

The Methodology for Assessing Population and Ecosystem Level Effects Related to Intake of Cooling Waters was used to estimate the potential effects due to postulated power plant development on Cayuga Lake, New York. This demonstration of the methodology used existing data and information on the biotic community of Cayuga Lake. Initial analyses indicated that major development would result in substantial direct effects on important fish populations and indirect effects on other components of the biotic community. Comprehensive analyses of population and community-level effects could not be demonstrated because the methods require more data than were available. The methodology was found to be adequate as the beginning step in a quantitative impact assessment. Further applications are needed to test the methodology as a useful tool in quantitative impact assessment.

18546 **(EPRI-EA—1762) Atmospheric effects of cooling lakes. Final report.** Vogel, J.; Hoff, F. (Illinois Inst. of Natural Resources, Champaign (USA). State Water Survey Div.). Apr 1981. 130p. NTIS, PC A07/MF A01.

The atmospheric effects of waste heat dissipation from cooling lakes operated in conjunction with power plants was assessed through a program of field measurements and analysis. An 890-hectare (2200-acre) cooling lake in southwestern Illinois was instrumented to provide necessary meteorological measurements. Analyses showed that steam fog and its downwind extent are the major atmospheric effects associated with cooling lakes, and that these effects maximize in winter and fall. However, the lake-induced fog is usually confined to the lake and short distances downwind. Consequently, cooling lakes with water-air temperature differences similar to those reported in Illinois and within a similar climatic regime can be located within 2 to 3 km of major highways, airports, or other centers of activity adversely affected by fog without any appreciable interference in the normal performance of such activities. Lake-related rime icing was either confined to the cooling lake or extended no more than 0.8 km downwind. Satellite and radar data showed no discernible increase of convective activity over or downwind of two cooling lakes in Illinois. For guidance in site planning and plant operations, a method is presented for determining the intensity and downwind extent of steam fog from known water-air temperature differences and ambient saturation deficits.

18547 **(FE—5490-10) Electrostatic granular bed filter development program. Quarterly technical report, July-September 1980.** Boericke, R.R. (General Electric Co., Schenectady, NY (USA). Energy Systems Programs Dept.). 22 Oct 1980. Contract AC21-79ET15490. 22p. NTIS, PC A02/MF A01.

This contract provides for laboratory experiments and analyses to develop electrostatic granular bed filtration for Pressurized Fluidized Bed (PFB) combined cycle application. These experiments will provide the data necessary to design a hot test model and to perform systems integration and economic evaluation stud-

ies. Based on the laboratory results, preliminary engineering estimates of the capital and operating costs will be provided for the selected approach. In parallel with the electrostatic granular bed filter testing, laboratory scale experiments and engineering assessments will be performed for two concepts for removing corrosive alkali metal vapor from the combustion gases. Progress is reported on the performance testing of electrostatic granular bed filters; corona charging studies; analytical models for predicting performance; systems analysis and economic studies; and alkali removal from the exit gas stream. (LCL)

18548 **Draft environmental impact statement. D.B. Wilson Station, Units 1 and 2 and associated transmission facilities.** Washington, DC; Department of Agriculture (1980). vp. (USDA-REA-EIS(ADM)—80-3-D). Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC. (MF or HC) Order No. 80-0288.

Construction and operation of two 440-megawatt (MW) coal-fired electric generating units at the 2205-acre D.B. Wilson Station plant site on the Green River at Matanzas in Ohio County, Kentucky are proposed by the Big Rivers Electric Corporation. The units would be tandem-compound four flow machines with an output at the busbar of approximately 395 MW each. Stack emissions would be controlled by lime or limestone scrubbers, electrostatic precipitators, and boiler design. Condenser cooling would be accomplished by use of cooling towers, and plant water would be drawn from the Green River. Additional facilities would include a 65.2-mile 345-kilovolt (kV) transmission line from the Reid Station to th Wilson Station to the Coleman Station, a 161-kV line running 75.6 miles from the Providence Substation to the Wilson Station to the Hardinsburg Substation, 3 switchyards, a 3-mile rail spur for cal delivery, flood protection dikes, a barge unloading facility, and a coal storage area with a 90-day capacity. The plant would provide power for the future needs of the applicant's member system, and also would offer adequate reserves for reliable service during periods of maintenance and emergency outages. Between 1981 and 1995, the applicant would pay annual taxes to federal, state, and local governments ranging from $214,777 to $815,680, and operation of the station would employ 237 persons. The units would: consume 3 million tons of coal and 213,000 tons of limestone annually; emit gaseous sulfur oxides, nitrogen oxides, and particulates into the atmosphere; and discharge wastewater into the Green River. The station would displace 2205 acres, including 175 to 200 acres of farmland and approximately 12.5 acres of wetland and wildlife habitat. Transmission lines would have an aesthetic impat on traversed lands. Site development would damage one archaeological site.

18549 **Final environmental impact statement. Proposed 280-MW generating facility at Holcomb, Kansas and associated 345-kV transmission facilities connecting Holcomb, Kansas to McCook, Nebraska for Sunflower Electric Cooperative.** Washington, DC; Department of Agriculture (1980). vp. (USDA-REA-EIS(ADM)—74-9-F). Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC. (MF or HC) Order No. 80-0437.

Construction of a 345-megawatt (MW) gross output, 280-MW net output coal-fired steam turbine generating plant near Holcomb, Finney County, Kansas and 150 miles of 345-kilovolt (kV) transmission facilities from the proposed Holcomb Generating Station to the Nebraska-Kansas state line in Decatur County, Kansas and Red Willow County, Nebraska is proposed. Fuel for the proposed plant would be obtained from the Powder River Basin in eastern Wyoming or Montana. The transmission facility would include 345 to 115 kV substations near Scott City, Setab County, and Colby, Mingo County, and would terminate at an interconnection with facilities of the Nebraska Public Power District. The estimated cost of the project is $420 million. The proposed project would assure the Sunflower Electric Cooperative members of a dependable supply of electricity, stimulate the agricultural economy by providing more power for irrigation pumps, generate employment, and reduce the cooperative's dependence on natural gas and oil. The power plant annually would release as much as 7000 tons of nitrogen oxide, and 340 tons of particulates, and would require approximately 4400 acre-feet of water which would result in a further lowering of the groundwater table. Vegetation on 575 acres would be removed. Transmission lines would require 2800 acres of right-of-way, including 12.5 acres of prime rangeland.

18550 **Final environmental impact statement. Wolcott-Malta 230-kV transmission line and related terminal facilities, Colorado (Supplement).** Washington, DC; Department of Agriculture (1980). 236p. (USDA-REA-EIS(ADM)—74-2-F). Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC. (MF or HC) Order No. 80-0290.

Construction of an 89-mile, 230-kilovolt transmission line between Wolcott and Malta in Eagle, Pitkin, and Lake counties, Colorado is proposed. Modification of the substations at the termini and construction of additional substations near Eagle and Basalt would accompany the project. This final supplement to the final environmental impact statement discusses alternative routing of the transmission line to allow consolidation of present and proposed transmission facilities passing through San Isabel and White River national forests. The new route would extend sothward from the Wolcott Substation through the Eagle area to Cottonwood Pass, continuing to Basalt where it would turn eastward up the Fryingpan River to the Malta Substation. The existing right-of-way would be expanded to 125 feet, and 28 miles of new right-of-way would be cleared. The line would serve both bulk transmission needs and local customer needs for the traversed area and also would permit the Colorado-Ute Electric Association, the Public Service Company of Colorado, and the Bureau of Reclamation's Fryingpan-Arkansas pumped storage project to exchange power. Property taxes paid by the applicant would add $369,000 to county tax bases in the area. The transmission line would disturb soil and vegetation and cause land leveling in some areas. The substations would cover 7 acres of land, and the transmission line right-of-way would require 122 acres. Existence of the line would mar the visual quality of traversed land and cause bird mortalities resulting from collisions.

18551 **Draft environmental impact statement. J.K. Smith Power Station, Units 1 and 2 and associated transmission facilities.** Washington, DC; Department of Agriculture (1980). vp. (USDA-REA-EIS(ADM)—80-8-D). Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC. (MF or HC) Order No. 80-0685.

Construction and operation of the 1300-megawatt (MW) gross (1200 MW net) J.K. Smith coal-fired steam electric generating station, to be located on a 3120-acre site near the Kentucky River in Clark County, Kentucky are proposed. Major station facilities would include two 650-MW gross (600 MW net) coal-fired units, two 151-meter (497-foot) natural draft cooling towers, a 110-acre water reservoir with an intake on the Kentucky River, two 216-meter (710-foot) stacks, boilers designed to reduce nitrogen emissions by 65%, a chemical waste treatment, a wet flue gas desulfurization system with a lime reagent component, electrostatic precipitators, a dry fixation process component for treatment of flue gas wastes and coal ash with on-site disposal of sludge, a 5-kilometer (km)(3-mile) rail spur, and a single 345-kilovolt (kV) and 138-kV switchyard. The station would transmit power through 176 kilometers (109 miles) 345 of 5-kV line, 71 km (47 miles) of 138-kV line, and 45 km (28 miles) of 161-kV line. The station would employ 250 people during operation, with an annual payroll estimated at $6.6 million, and would generate over $3 million in state and county property taxes and $552,000 in employee income taxes per year. Use of the site would result in the disturbance of 830 acres of wildlife habitat and removal of 1641 acres of cropland and pasture from use, and 182 miles of transmission rights-of-way would require clearance of 20 acres of farmland and 1300 acres of woodland. Emission of sulfur dioxide, nitrogen oxides, and particulates would degrade ambient air quality somewhat. Some pollutants would enter the river in waste effluents. Construction of intake pipes behind Lock and Dam 10 would require removal of 1000 cubic yards of river bottom material. Ambient noise levels would be increased for some residents in the vicinity of the station.

18552 Final environmental impact statement. Missouri Basin Power Project: Wheatland Generating Station, Units 1, 2, and 3 and associated transmission, and Grayrocks Reservoir (Supplement). Washington, DC; Department of Agriculture (1980). 147p. (USDA-REA-EIS(ADM)—76-2-DS). Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC. (MF or HC) Order No. 80-0689.

Construction and operation of a three-unit, 1500-megawatt power plant and a 104,100-acre-foot storage reservoir at the Wheatlant Generating Station on the Laramie River in Platte County, Wyoming are proposed. This supplement to the final environmental impact statement of May 1976, prepared in response to a ruling by the US District Court, District of Nebraska, discusses the effects of the project on the Lake McConaughy rainbow trout fishery and other fisheries, critical habitat of the whooping crane, the central flyway in Nebraska, agricultural enterprises in the area, and regional groundwater resources. Operation of the reservoir would allow downstream flow augmentation in the river system during July, August, and September, benfiting fisheries and possibly benefiting agricultural enterprises. The project, along with the proposed Corn Creek irrigation project and predictable groundwater pumping in Nebraska, would reduce sport fish harvest by one percent, could cause local aquifer depletions, and would reduce flows to critical fish habitat by 25 to 30 cubic feet per second. Cumulative flow depletions could damage crane and waterfowl habitat in the Big Bend area. Agricultural and economic effects from the combined depletions could result in the loss of 8000 to 10,000 irrigated acres and an associated decrease in farm output, personal income, and employment.

18553 Draft environmental impact statement. Escalante Coal-Fired Electric Generating Station and related transmission facilities. Washington, DC; Department of Agriculture (1979). vp. (USDA-REA-EIS(ADM)—79-6-D). Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC. (MF or HC) Order No. 79-1039.

Construction of the Escalante 233-megawatt (MW) coal-fired electric generating station five kilometers northwest of Prewitt in McKinley County, New Mexico is proposed. The generator, on a 2720-acre site, would produce a net output of 210 MW. Appurtenant facilities would include a five-kilometer railroad spur from the station to the Atchison, Topeka, and Santa Fe rail line and a water well field and pipeline to furnish coolant for the generator. Fuel for the plant would originate in the Power River basin area of northeast Wyoming and eventually from mines in New Mexico as well. The station would transmit electricity through two 115-kilovolt (kV) power lines extending 19 kilometers to the Ambrosia Lake Substation and one 115-kV line extending 10 kilometers to the existing plains Electric 115-kV line. Power generated by the plant would help meet the requirements of the applicant's 12-member cooperative, which is expected to create a power deficit of 232.2 MW by the spring of 1984. Elimination of intensive grazing from the plant site would allow the succession of a diversity of biota. loss of 2720 acres of grazing land would remove 17 to 25 animal unit months of forage per year. Pipelines and transmission lines would traverse Indian land, and the 152-meter stack rising above the plant would mar the landscape. The generator would consume 1.1 million metric tons of coal and 4800 acre-feet of groundwater, and emit 3.25 million kilograms of nitrogen oxides, 2.15 million kilograms of sulfur dioxide, and 0.22 million kilograms of particulates annually.

18554 Final environmental impact statement. Ojo to Taos, New Mexico, 345-kV transmission line and related terminal facilities. Washington, DC; Department of Agriculture (1979). 156p. (USDA-REA-EIS(ADM)—79-13-F). Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC. (MF or HC) Order No. 79-1043.

Construction of 38 miles of 345-kilovolt (kV) transmission line between Ojo and Taos in Taos and Rio Arriba counties, New Mexico is proposed. Project features would include construction of 6.6 wooden, two-pole K-frames per mile within a new right-of-way of 150 feet; suspension of a single circuit line; construction of an additional tower structure at the Ojo substation; and a 15-acre expansion of the Taos substation, including transformer banks, tower structures, and fencing. The two alternative alignments would be built parallel and adjacent to the existing 115-kV line except for a four-mile segment at the southern end. The proposed facility would be energized at 155 kV for approximately five years and later would be converted to 345 kV as required. Planned improvements would furnish additional electric transmission capacity to meet the projected demand from the Kit Carson, Springer, and Mora San Miguel distribution cooperatives that serve a nine-county area. The project would require acquisition of 15 acres of land for expansion of the Taos substation and 18.2 acres of right-of-way per mile for the transmission line. The line would cross and intrude on the scenic quality of several classified areas, including the Rio Grande at a point where it has been classified as a wild and scenic river; Tract A of the Taos Indian Reservation; and a large area designed by New Mexico as recreation lands. The alignment also would cross the Rio Grande Gorge State Park. Construction and right-of-way maintenance activities would disturb wildlife and would destroy some plants of the species Astragalus puniceus var Gertrudis, which has been nominated for inclusion on the proposed threatened plant list.

18555 Draft environmental impact statement. Colorado-Ute Coal-Fired Power Plant (Craig Unit 3). Washington, DC; Department of Agriculture (1979). 388p. (USDA-REA-EIS(ADM)—79-10-D). Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC. (MF or HC) Order No. 79-1037.

Construction of a third 400-megawatt coal-fired, steam-electric generating unit at the Craig Station adjacent to the Yampa River near Craig, Moffat County Colorado is proposed. Fuel for the unit would be obtained from local reserves and would be crushed and sockpiled at the plant site. The pulverized coal boiler for the unit would be a balanced draft, drum-type, radiant unit with superheater, reheater, and economizer components and a maximum burn rate of 4300 million British thermal units per hour. The unit would be designed to control particulate removal and sulfur dioxide and nitrogen oxide emissions. Water would be supplied from an existing intake structure on the Yampa River, and a mechanical draft cooling tower would be provided. Construction would begin in November 1979, with operation planned for April 1983. The unit would help the Colorado-Ute Electric Association meet projected energy demands and would stimulate the local economy. Operation of the proposed unit would result in the emission of some particular matter, sulfur dioxide, and nitrogen oxides into the atmosphere and in the nitrogen oxides into the atmosphere and in the generation of noise. Water consumption for the three units at Craig would increase from 12,800 acre-feet to 17,200 acre-feet annually. Delivery of coal and other materials would intensify local traffic.

18556 Draft environmental impact statement. Proposed 280-MW generating facility at Holcomb, Kansas and associated 345-kV transmission facilities connecting Holcomb, Kansas to McCook, Nebraska for Sunflower Electric Cooperative. Washington, DC; Department of Agriculture (1979). vp. (USDA-REA-EIS(ADM)—79-9). Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC. (MF or HC) Order No. 79-1038.

Construction of a 34-megawatt (MW) gross output, 280-MW net output coal-fired steam turbine generating plant near Holcomb, Finney County, Kansas and 150 miles of 345-kilovolt (kV) transmission facilities from the proposed Holcomb Generating Station to the Nebraska-Kansas state line in Decatur County, Kansas and Red Willow County, Nebraska is proposed. Fuel for the proposed plant would be obtained from the Powder River Basin in eastern Wyoming or Montana. The transmission facility would include 345 to 115-kV substations near Scott City, Setab County, and Colby, Mingo County, and would terminate at an interconnection with facilities of the Nebraska Public Power District. The estimated cost of the project is $420 million. The proposed project would assure the Sunflower Electric Cooperative members of a dependable supply of electricity, stimulate the agricultural economy by providing more power for irrigation pumps, generate employment, and reduce the cooperative's dependence on natural gas and oil. The power plant annually would release as much as 7000 tons of sulfur dioxide, 5700 tons of nitrogen oxide, and 340 tons of particulates, and would require approximately 4400 acre-feet of water which would result in a further lowering of the groundwater table. Vegetation on 575 acres would be removed. Transmission lines would

require 2800 acres of right-of-way, including 12.5 acres of prime rangeland, prime farmland, and irrigated farmland, and the substations would require an additional 40 acres.

18557 Draft environmental impact statement. New Madrid-Blytheville 500-kV transmission facilities. Washington, DC; Department of Agriculture (1979). vp. (USDA-REA-EIS(ADM)—79-2-D). Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC. (MF or HC) Order No. 79-0660.

Construction and operation of 55 miles of 500-kilovolt (kV) transmission line from New Madrid, Missouri to Blytheville, Arkansas is proposed by Associated Electric Cooperative. The project also would involve construction of a new substation near Blytheville and expansion of the existing 345-kV substation at New Madrid. The substation would be constructed by the Arkansas-Missouri Power Company and the transmission line would be constructed by M and A Electric Power Cooperative. The proposed line would increase the transfer capabilities between the two power companies, improve transmission system reliability, and reduce seasonal overloading of existing 161-kV lines in southeast Missouri. It also would provide an additional path from the New Madrid generating station, increasing the transient stability of that facility. Approximately 1210 acres of agricultural land would be required for transmission line right-of-way.

18558 Draft environmental impact statement. Seminole Plant Units 1 and 2 and associated transmission facilities. Washington, DC; Department of Agriculture (1979). vp. (USDA-REA-EIS(ADM)—79-3-D). Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC. (MF or HC) Order No. 79-0658.

Construction of two 600-megawatt coal-fired, steam-electric-generating units on a 2000-acre site adjacent to the St. Johns River, near the city of Palatka in Putnam County, Florida, is proposed. Major station features would include two 450-foot natural-draft cooling towers, a wet-limestone flue-gas desulfurization (FGD) system, electrostatic precipitators for particulate collection, boilers designed to reduce nitrogen oxides, a 675-foot-high stack, a chemical waste-treatment system, onsite disposal of FGD wastes, and rail delivery of coal. The units would transmit power through 69 miles of double-circuit 230-kilovolt transmission lines. The project would improve the reliability of the bulk generation and transmission system serving the Florida peninsula. The multiyear construction phase would increase income in the area, and by 1985 the plant would contribute $11.7 million yearly to county property taxes. Atmospheric concentrations of sulfur dioxide, nitrous oxides, and particulate matter would increase slightly in the vicinity of the plant Emissions could result in the formation of acidic sulfate in rainwater, which would degrade surface water, soil, and vegetation. Withdrawal of up to 16,127 gallons per minute of water from the St. Johns River would entrap and entrain small aquatic organisms. The discharge of blowdown from the cooling towers would degrade water quality in the river, and dredging operations would increase turbidity and suspended sediments and eliminate macrophytic habitat. The potentiometric surface of the Floridan aquifer would be lowered locally. Site preparation woud require the clearing of approximately 420 acres, including 290 acres of sandhill habitat and stands of pine flatwood and cypress. Habitat for amphibians, reptiles, and small mammals, including the threatened gopher tortoise and indigo snake, could be disturbed or destroyed.

2003 Power Transmission And Distribution

REFER ALSO TO CITATION(S) 18303, 18745, 19059

18559 (DOE/CE/20505—2) Evaluation of higher distribution and/or utilization voltages. First interim report (December 1978): literature search and problem definition. (ECON, Inc., Princeton, NJ (USA)). Apr 1981. Contract AC01-78ET20505. 59p. NTIS, PC A04/MF A01.

A literature search has been conducted on the economics and technical problems associated with the use of higher voltages in both the primary distribution and secondary utilization systems. After a literature review and evaluation, an assessment of the state-of-the-art with regard to high voltage has been made and is presented for the primary and secondary distribution systems, end use elements, and economics and system analysis or optimization. An annotated bibliography is provided for each of the three categories. A comprehensive list of potential advantages and disadvantages of higher primary distribution and utilization voltages has also been prepared and is presented.

18560 (DOE/CE/20505—3) Evaluation of higher distribution and/or utilization voltages. Second interim report (March 1979): identification of components and parameters for cost and energy-efficiency analysis. (ECON, Inc., Princeton, NJ (USA)). Apr 1981. Contract AC01-78ET20505. 75p. NTIS, PC A04/MF A01.

This interim report provides documentation on the second task, Identification of Components and Parameters for Cost and Energy-Efficiency Analysis, of DOE Contract No. ET-78-C-01-2866, Evaluation of Higher Distribution and/or Utilization Voltages. The work performed under this task includes an identification of the elements of the distribution/utilization system, a characterization of the distribution elements and a characterization of end use elements. The purpose of this task is to identify the distribution and utilization system elements which will be subjected to a detailed analysis and computer modeling in later tasks. The elements identified are characterized in terms of their interface with other elements in the system and with respect to their energy consumption, efficiency, and costs. A major output of this task is a list of elements to be modeled under Task 3 and a set of specifications for the computer model to be developed under that task.

18561 (DOE/CE/20505—4) Evaluation of higher distribution and/or utilization voltages. Third interim report (October 1979): analysis of individual component cost and/or energy efficiencies. (ECON, Inc., Princeton, NJ (USA)). Apr 1981. Contract AC01-78ET20505. 148p. NTIS, PC A07/MF A01.

This interim report provides documentation on the third task, Analysis of Individual Component Cost and/or Energy Efficiencies, of DOE Contract No. ET-78-C-01-2866, Evaluation of Higher Distribution and/or Utilization Voltages. The work performed under this task includes the development of both cost and energy loss models for the distribution and customer utilization system elements as well as the analysis of critical performance variables for the types of motors in end use elements, as a function of voltage level. The purpose of this task is to provide individual component cost and energy models which will be incorporated in the global system optimization program under Task 4. A major output of this task is a mathematical model for each component's cost and/or energy losses and a graphical representation of each model.

18562 (DOE/CE/20505—5) Evaluation of higher distribution and/or utilization voltages. Fourth interim report (August 1980): assessment of optimum distribution configuration. (ECON, Inc., Princeton, NJ (USA)). Apr 1981. Contract AC01-78ET20505. 309p. NTIS, PC A14/MF A01.

This interim report provides documentation on the fourth task, Assessment of Optimum Distribution Configuration, of DOE Contract No. ET-78-C-01-2866, Evaluation of Higher Distribution and/or Utilization Voltages. The work performed under this task includes the development of a computer model for assessment of life cycle costs for the distribution and utilization systems, the development of an optimization algorithm to enable distribution system configuration optimization and a net energy analysis to determine potential net energy savings. Input data for this task derive from Task 3. The major output of this task is a documented computer code.

18563 (DOE/CE/20505—6) Evaluation of higher distribution and/or utilization voltages. Fifth interim report (September 1980): assess constraints to higher voltage implementation. (ECON, Inc., Princeton, NJ (USA)). Apr 1981. Contract AC01-78ET20505. 17p. NTIS, PC A02/MF A01.

This interim report provides documentation on the fifth task, Assess Constraints to Higher Voltage Implementation, of DOE Contract No. ET-78-C-01-2866, Evaluation of Higher Distribution and/or Utilization Voltages. The work performed under this task

includes the development of a list of impediments to higher voltage implementation including both technological and economic factors, an assessment of the impact of reduced costs for high voltage equipment on the selection of an optimal voltage and a set of recommendations for further work.

18564 **(EPRI-EL—850(Vo.3)) Determining load characteristics for transient performance. Volume 3. Load-composition data analysis. Final report.** Gentile, T.; Ihara, S.; Murdoch, A.; Simons, N. (General Electric Co., Schenectady, NY (USA). Electric Utility Systems Engineering Dept.). Mar 1981. 55p. NTIS, PC A04/MF A01.

This study evaluated a prototype load modeling procedure developed by the University of Texas at Arlington (UTA) in EPRI project RP849-3. Tests were run on three different power systems to evaluate the procedure's accuracy in modeling the dynamic power response of loads (active and reactive) when subjected to limited excursions of voltage and frequency. In support activities, guidelines were developed for the load modeling procedure, and possible data sources for it were investigated. The period of performance was September 1976 to July 1980. The work accomplished is reported in a final report of four volumes. In this volume possible data sources for the load modeling procedure are identified and analyzed as to their potential for use in determining the composition of bus load by component. A methodology is proposed.

18565 **(EPRI-EL—850(Vol.1)) Determining load characteristics for transient performance. Volume 1. Executive summary. Final report.** Gentile, T.; Ihara, S.; Murdoch, A.; Simons, N. (General Electric Co., Schenectady, NY (USA). Electric Utility Systems Engineering Dept.). Mar 1981. 42p. NTIS, PC A03/MF A01.

This study evaluated a prototype load modeling procedure developed by the University of Texas at Arlington (UTA) in EPRI project RP849-3. Tests were run on three different power systems to evaluate the procedure's accuracy in modeling the dynamic power response of loads (active and reactive) when subjected to limited excursions of voltage and frequency. In support activities, guidelines were developed for the load modeling procedure, and possible data sources for it were investigated. The period of performance was September 1976 to July 1980. The work accomplished is reported in a final report of four volumes. This volume, the executive summary, presents an overview and summary of results. Recommendations are made for the research necessary to develop a production grade load modeling procedure.

18566 **(EPRI-EL—850(Vol.2)) Determining load characteristics for transient performance. Volume 2. Load-model guidelines. Final report.** Gentile, T.; Ihara, S.; Murdoch, A.; Simons, N. (General Electric Co., Schenectady, NY (USA). Electric Utility Systems Engineering Dept.). Mar 1981. 60p. NTIS, PC A04/MF A01.

This study evaluated a prototype load modeling procedure developed by the University of Texas at Arlington (UTA) in EPRI project RP849-3. Tests were run on three different power systems to evaluate the procedure's accuracy in modeling the dynamic power response of loads (active and reactive) when subjected to limited excursions of voltage and frequency. In support activities, guidelines were developed for the load modeling procedure, and possible data sources for it were investigated. The period of performance was September 1976 to July 1980. The work accomplished is reported in a final report of four volumes. In this volume guidelines are developed for a load modeling procedure, and induction motor characteristics and their effect on system stability are examined.

18567 **(EPRI-EL—850(Vol.4)) Determining load characteristics for transient performance. Volume 4. Test results and analysis. Final report.** Gentile, T.; Ihara, S.; Murdoch, A.; Simons, N. (General Electric Co., Schenectady, NY (USA). Electric Utility Systems Engineering Dept.). Mar 1981. 86p. NTIS, PC A05/MF A01.

This study evaluated a prototype load modeling procedure developed by the University of Texas at Arlington (UTA) in EPRI project RP849-3. Tests were run on three different power systems to evaluate the procedure's accuracy in modeling the dynamic power response of loads (active and reactive) when subjected to limited excursions of voltage and frequency. In support activities, guidelines were developed for the load modeling procedure, and possible data sources for it were investigated. The period of performance was September 1976 to July 1980. The work accomplished is reported in a final report of four volumes. In this volume test results on three power systems are reported and analyzed. An evaluation of the UTA load modeling procedure is made.

18568 **(EPRI-EL—1773) Reliability indexes for power systems. Final report, March 1981.** Albrecht, P.F.; Garver, L.L.; Jordan, G.A.; Patton, A.D.; Van Horne, P.R. (General Electric Co., Schenectady, NY (USA)). Mar 1981. 313p. NTIS, PC A14/MF A01.

Three main objectives were accomplished during this project. The first objective was to review the traditional treatment of power system reliability indexes. A qualitative analysis of both generation and transmission indexes is presented along with a detailed examination of the analytic and computational algorithms which have been developed. Several algorithms are given that are computationally more efficient than those commonly given in the literature. The second objective was to advance the state of the art by developing a unified probability framework for the definition of power system reliability indexes. The key idea in this approach is the notion of a reliability indicator as an observable characteristic central to describing the reliability of a system. Using this concept, reliability indexes are defined as parameters of probability laws of reliability indicators, thereby providing new insights for the understanding and computation of reliability indexes. The final objective was to evaluate all of the reliability indexes in terms of their usefulness to utility planners and consumers and to determine the characteristics required for quantification of the worth of reliability. Based on interviews with both utility planners and regulators, a ranking of reliability indexes was developed.

18569 **High voltage electric bushing.** Cookson, A.H. (to Dept. of Energy). US Patent Application 167,501. 11 Jul 1980. 11p.

A high voltage electric bushing comprises a hollow elongated dielectric weathershed which encloses a high voltage conductor. A collar formed of high volage dielectric material is positioned over the weathershed and is bonded thereto by an interface material which precludes moisture-life contaminants from entering between the bonded portions. The collar is substantially thicker than the adjacent weathershed which it surrounds, providing relief of the electric stresses which would otherwise appear on the outer surface of the weathershed. The collar may include a conductive ring or capacitive foil to further relieve electric stresses experienced by the bushing.

21 NUCLEAR POWER PLANTS

18570 **(ORAU/IEA—80-3(P)) Acceptable future nuclear energy system. Gatlinburg II condensed workshop proceedings, December 10-12, 1979, Gatlinburg, Tennessee.** Firebaugh, M.W.; Ohanian, M.J. (eds.). (Oak Ridge Associated Universities, Inc., TN (USA)). Mar 1980. Contract AC05-76OR00033. 250p. NTIS, PC A11/MF A01.

Separate abstracts are included for the papers presented concerning nuclear power plant safety; siting considerations; operator training; nuclear utility structure; and public opinion.

18571 (ORAU/IEA—80-3(P), pp 99-118) **Operating corps. Professionalization of the operating corps.** Levenson, M. Mar 1980. NTIS, PC A11/MF A01.

In Acceptable future nuclear energy system. Gatlinburg II condensed workshop proceedings, December 10-12, 1979, Gatlinburg, Tennessee.

Educational and training requirements for reactor operators and other reactor personnel are reviewed. Quality assurance in the design and fabrication of nuclear power plants is discussed.

18572 (ORAU/IEA—80-3(P), pp 119-126) **Nuclear utility structure. Institutional options.** Paige, H.W. Mar 1980. NTIS, PC A11/MF A01.

In Acceptable future nuclear energy system. Gatlinburg II condensed workshop proceedings, December 10-12, 1979, Gatlinburg, Tennessee.

The institutional structures, roles, and missions related to nuclear power generation in the US are reviewed. Possible changes are presented.

18573 (ORAU/IEA—80-3(P), pp 127-146) **Nuclear utility structure. Use of nuclear service companies.** Ring, L.E. Mar 1980. NTIS, PC A11/MF A01.

In Acceptable future nuclear energy system. Gatlinburg II condensed workshop proceedings, December 10-12, 1979, Gatlinburg, Tennessee.

The feasibility of utilities incorporating service companies to construct and maintain nuclear power plants is analyzed. Responsibilities of the service companies and the public opinion of the concept are discussed.

18574 (ORAU/IEA—80-3(P), pp 146-174) **Federal government's role.** Green, H. Mar 1980. NTIS, PC A11/MF A01.

In Acceptable future nuclear energy system. Gatlinburg II condensed workshop proceedings, December 10-12, 1979, Gatlinburg, Tennessee.

The roles of the Nuclear utility structure. The Federal Government and Nuclear Regulatory Commission in the construction, operation, and quality control of nuclear power plants are reviewed.

18575 (ORAU/IEA—80-3(P), pp 175-202) **Public education and attitudes. Introductory comments.** Firebaugh, M. Mar 1980. NTIS, PC A11/MF A01.

In Acceptable future nuclear energy system. Gatlinburg II condensed workshop proceedings, December 10-12, 1979, Gatlinburg, Tennessee.

Important features of public attitudes toward nuclear energy and some analyses of these attitudes in terms of risk perception and symbolism are described.

2101 Power Reactors, Non-breeding, Light-water Moderated, Boiling Water Cooled

REFER ALSO TO CITATION(S) 18587, 18610, 18613, 18623, 18624

18576 **(ORNL-tr—4736) Experimental study of the vibration of an elastic rod pair in parallel gas-liquid two-phase flow.** Uehara, K.; Hara, F.; Yamashita, T. (Oak Ridge National Lab., TN (USA)). [nd]. Translated from 80th anniversary memorial meeting (Tokyo), October 9, 1977, pp 755-763. (CONF-7710239—1). 21p. NTIS, PC A02/MF A01.

From 80. anniversary memorial meeting; Tokyo, Japan (9 Oct 1977).

An experiment was conducted concerning the characteristics of the vibration of a flat plate elastic rod pair placed in parallel with a gas-liquid two-phase flow inside a circular pipe, and the characteristics of the gas-liquid two-phase flow in relation to the elastic rod pair, as well as the relationships of these characteristics with the vibration of the elastic rod pair were clarified.

18577 **(DOE/ET/34215—19) Fuel performance improvement program. Semiannual progress report, April-September 1980.** Crouthamel, C.E.; Freshley, M.D. (Battelle Pacific Northwest Labs., Richland, WA (USA); Exxon Nuclear Co., Inc., Richland, WA (USA)). Oct 1980. Contract AC06-76RL01830;AC02-76ET34215. 84p. NTIS, PC A05/MF A01.

Progress on the Fuel Performance Improvement Program's fuel test and demonstration irradiations is reported for the period April-September, 1980. Included are results of out-of-reactor experiments with zircaloy cladding on the iodine assisted stress corrosion cracking mechanism. Preliminary results from the first eight ramp tests performed in the Halden Boiling Water Reactor are reported. The status of demonstration fuel irradiations in the Big Rock Point Reactor is described.

18578 **(EPRI-NP—1770-SR) LWR core materials performance program: progress in 1979-1980.** Franklin, D.; Ocken, H.; Oldberg, T. (Electric Power Research Inst., Palo Alto, CA (USA). Systems and Materials Dept.). Mar 1981. 92p. NTIS, PC A05/MF A01.

Goals of the program are to increase plant availability by determining the response of core component materials, by developing a comprehensive fuel performance data base, and by developing accurate models and computer codes. Currently, there are twenty-two active projects that range in scope from test reactor experiments of advanced fuel types to large-scale testing of prototypic fuel assemblies. During 1979 and 1980, several projects produced significant results concerning: (1) power reactor fuel performance, particularly fission gas release, fuel swelling, clad oxidation, fuel rod growth, and fuel rod bow, (2) test reactor fuel performance of new fuel types, particularly fission gas release and fuel-cladding mechanical interaction, and (3) fuel rod reliability modeling.

18579 **(GEAP—25332-1) Improved uranium-utilization program, Phase I. First semiannual report, September 1979-March 1980.** Hopkins, G.C. (comp.). (General Electric Co., San Jose, CA (USA). Nuclear Energy Engineering Div.). Nov 1980. Contract ET-79-A-02-5117. 78p. NTIS, PC A05/MF A01.

The Improved Uranium Utilization Program includes a Phase I evaluation of BWR design alternatives which have potential to reduce uranium ore requirements in once-through fuel cycles. The Phase I project is evaluating the alternatives in detail, including considerations of reliability, performance, manufacturing, safety and economics; is establishing implementation development requirements, costs and schedules; is selecting the most promising alternatives; and is developing detailed plans for Phase II projects for implementation. Emphasis is being placed on developing practical alternatives which can be demonstrated at the earliest possible date in existing operating BWR nuclear power stations. Priority is being given to alternatives which have the maximum payoff, measured by reduction of the nation's uranium resource requirements, on the shortest schedule. Alternatives included in current evaluations are: improved refueling and control rod pattern optimization, spectral shift, extended burnup, reduction in gadolinia residual, axial blanket optimization, reconstitution, and combinations of these alternatives.

18580 **(SAND—80-2068C) Effect of dc-power-system reliability on reactor-shutdown cooling.** Kolaczkowski, A.M.; Baranowsky, P.W.; Hickman, J.W. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 5p. (CONF-810606—4). NTIS, PC A02/MF A01.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

The DC power systems in a nuclear power plant provide control and motive power to valves, instrumentation, emergency diesel generators, and many other components and systems during all phases of plant operation including abnormal shutdowns and accident situations. A specific area of concern is the adequacy of the minimum design requirements for DC power systems, particularly with regard to multiple and common cause failures. This concern relates to the application of the single failure criterion for assuring a reliable DC power supply which may be required for the functionability of shutdown cooling systems. The results are presented of a reliability based study performed to assess the adequacy of DC power supply design requirements for currently operating light water reactors with particular attention to shutdown cooling requirements.

18581 **(SAND—81-0067C) Two-fluid modeling of two-phase flow in BWR cores.** Dube, D.A.; Lanning, D.D. (Sandia National Labs., Albuquerque, NM (USA); Massachusetts Inst. of Tech., Cambridge (USA)). 1981. Contract AC04-76DP00789. 6p. (CONF-810606—14). NTIS, PC A02/MF A01.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

Two-fluid modeling of two-phase flow represents the state-of-the-art in the thermal-hydraulic analysis of light water reactors.

For example, computer codes such as TRAC and THERMIT have been used for a wide variety of studies ranging from pressurized water reactor core modeling to analysis of flow instability problems in steam generators. An unfortunate consequence of the semi-implicit numerical solution technique which is used, however, is that the maximum time step size Δt is limited by a stability condition. For boiling water reactor transient analysis where there is significant boiling and slip between the phases, this restriction on the time step size may be as small as 10 ms. For this reason, a fully implicit two-fluid, one-dimensional, multi-channel model for analyzing two-phase flow has been developed and is summarized. The intent is the development of a numerically stable solution method which would allow large time step sizes. Emphasis has been placed on steady state and mild transient analysis of boiling water reactor cores.

18582 (SAND—81-0143C) Alternative decay-heat-removal systems: options for improved safety. Berry, D.L.; Sanders, G.A. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 3p. (CONF-810606—16). NTIS, PC A02/MF A01.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

During the last several years, members of the United States Nuclear Regulatory Commission (USNRC) staff and advisory committees have expressed an interest in improved reliability for decay heat removal systems in nuclear power plants. The 1978 research plan for the USNRC called for an evaluation of alternative decay heat removal concepts, and a program to carry out such an evaluation was started at Sandia National Laboratories early in 1979. This paper presents the results of the first phase of Sandia's program.

18583 Mechanistic prediction of transient fission-gas release from LWR fuel. Rest, J.; Gehl, S.M. (Argonne Natl Lab, Ill). *Nuclear Engineering and Design ;* **56**: No. 1, 233-256(Feb 1980). (CONF-780342—).

From Meeting on fuel element modeling; Blackpool, UK (13 Mar 1978).

The steady-state and transient gas release and swelling subroutine (GRASS-SST) is a mechanistic computer code for the prediction of fission-gas behavior in UO_2-base fuels. GRASS-SST treats fission-gas release and fuel swelling on an equal basis and simultaneously treats all major mechanisms that influence fission-gas behavior. The GRASS-SST transient analysis has evolved through comparisons of code predictions with the fission-gas release and physical phenomena that occur during reactor operation and transient direct-electrical heating (DEH) testing of irradiated light-water reactor fuel. 42 refs.

18584 Assurance of integrity of LWR pipe and pressure vessels. Zebroski, E.; Dau, G.; Smith, R.; Stahlkopf, K. (EPRI, Palo Alto, Calif). *Proceedings of the American Power Conference ;* **41**: 121-138(1979). (CONF-790443—).

From American power conference; Chicago, IL, USA (23 Apr 1979).

The purpose of this paper is to present current goals and incentives, as well as significant recent accomplishments in the various program areas relating to the assurance of integrity of LWR pipe and pressure vessels in the light of the events at the Three Mile Island Plant Unit 2. The plans for research to be carried out over the next five years are also described. 45 refs and bibliography.

2102 Power Reactors, Non-breeding, Light-water Moderated, Non-boiling Water Cooled

REFER ALSO TO CITATION(S) 18577, 18578, 18580, 18582, 18583, 18584, 18606, 18611, 18613, 18615, 18616, 18622, 18623, 18624

18585 (DOE/ET/34020—1) Axial blanket fuel design and demonstration. First semiannual progress report, January-September 1980. Hannah, M.A. (Babcock and Wilcox Co., Lynchburg, VA (USA)). Nov 1980. Contract AC02-79ET34020. 69p. (BAW—1643-1). NTIS, PC A04/MF A01.

The axial blanket fuel design in this program, which is retrofittable in operating pressurized water reactors, involves replacing the top and bottom of the enriched fuel column with low-enriched ($\leqq$ 1.0 wt % ^{235}U) fertile uranium. This repositioning of the fissile inventory in the fuel rod leads to decreased axial leakage and increased discharge burnups in the enriched fuel. The combination of these two phenomena yields both improved uranium utilization and reduced fuel cycle costs without significantly impacting either fuel performance or plant safety. Various axial blanket fuel designs, with blanket thicknesses from 0 to 10 inches and blanket enrichments from 0.2 to 1.0 wt % ^{235}U, were investigated to determine the relationship between uranium utilization and power peaking. Analyses were performed to assess the nuclear, mechanical, and thermal-hydraulic effects arising from the use of axial blankets. Four axial blanket lead test assemblies are being fabricated for scheduled irradiation in cycle 5 of Sacramento Municipal Utility District's Rancho Seco pressurized water reactor. Analyses to support licensing cycle 5 are in progress.

18586 (DOE/ET/34020—1) Axial blanket fuel design and demonstration. First semi-annual progress report, January-September 1980. (Babcock and Wilcox Co., Lynchburg, VA (USA)). Nov 1980. Contract AC02-79ET34020. 73p. (BAW—1643-1). NTIS, PC A04/MF A01.

The axial blanket fuel design in this program, which is retrofittable in operating pressurized water reactors, involves replacing the top and bottom of the enriched fuel column with low-enriched ($\leqq$ 1.0 wt % ^{235}U) fertile uranium. This repositioning of the fissile inventory in the fuel rod leads to decreased axial leakage and increased discharge burnups in the enriched fuel. Various axial blanket fuel designs, with blanket thicknesses from 0 to 10 inches and blanket enrichments from 0.2 to 1.0 wt % ^{235}U, were investigated to determine the relationship between uranium utilization and power peaking. Analyses were preformed to assess the nuclear, mechanical, and thermal-hydraulic effects arising from the use of axial blankets. Four axial blanket lead test assemblies are being fabricated for scheduled irradiation in cycle 5 of Sacramento Municipal Utility District's Rancho Seco pressurized water reactor. Analyses to support licensing cycle 5 are in progress.

18587 Advance reactor and fuel-cycle systems--potentials and limitations for United States utilities. Zebroski, E.L.; Williams, R.F. (EPRI, Palo Alto, Calif). *Proceedings of the American Power Conference ;* **41**: 259-265(1979). (CONF-790443—).

From American power conference; Chicago, IL, USA (23 Apr 1979).

This paper reviews the potential benefits and limitations of advance reactor and fuel-cycle systems for United States utilities. The results of the review of advanced technologies show that for the near and midterm, the only advance reactor and fuel-cycle system with significant potential for United States utilities is the current LWR, and evolutionary, not revolutionary, enhancements. For the long term, the liquid-metal breeder reactor continues to be the most promising advance nuclear option. The major factors leading to this conclusion are summarized.

2103 Power Reactors, Non-breeding, Graphite Moderated

REFER ALSO TO CITATION(S) 18597, 18981

18588 (GA-A—16314) Implications of materials behavior on design codes. Roberts, D.I. (General Atomic Co., San Diego, CA (USA)). Apr 1981. Contract AT03-76ET35301. 15p. (CONF-810530—2). NTIS, PC A02/MF A01.

From IAEA specialists' meeting on high-temperature metallic materials for application in gas-cooled reactors; Vienna, Austria (4 May 1981).

In the US, the design of Class 1 elevated-temperature components of reactor systems is governed by the rules of ASME Boiler and Pressure Vessel Cases N47 (design) and N48 (construction). The rules of Case N47, in particular, are sophisticated and complex, and a substantial quantity of materials behavior data is needed to design to these rules. Requirements include a detailed knowledge of creep, rupture, creep-fatigue, etc. In addition, many other factors, including such aspects as the influence on service performance of environment, welds, and fabrication-induced cold work, must be considered in the design. This paper reviews the

impact of some recent HTGR materials data on design rules and approaches. In the construction area, for example, recent data regarding the elevated-temperature properties and behavior of cold-formed austenitic materials such as Alloy 800H have resulted in rule changes. Observed creep-fatigue behavior of Alloy 800H and 2-1/4Cr to 1Mo steel is causing active review of the pertinence of linear damage summation approaches.

18589 (GA-A—16319) Interaction of metals with primary coolant impurities: comparison of steam-cycle and advanced HTGRs. Johnson, W.R.; Lai, G.Y. (General Atomic Co., San Diego, CA (USA)). Apr 1981. Contract AT03-76ET35301. 25p. (CONF-810530—3). NTIS, PC A02/MF A01.

From IAEA specialists' meeting on high-temperature metallic materials for application in gas-cooled reactors; Vienna, Austria (4 May 1981).

The carburization behavior of Incoloy 800H, Inconel 617, and Hastelloy X in helium containing various amounts of H_2, CO, CH_4, H_2O, and CO_2 was studied. Corrosion tests were conducted in a temperature range from 649° to 1000°C (1200° to 1832°F) for exposure times up to 10,000 h. Four different helium environments, identified as A, B, C, and D, were investigated. Concentrations of gaseous impurities were 150 Pa H_2, 45 Pa CO, 5 Pa CH_4, and 5 Pa H_2O for Environment A; 20 Pa H_2, 10 Pa CO, 2 Pa CH_4, 5 Pa H_2O, and 0.5 Pa CO_2 for Environment B; 50 Pa H_2, 5 Pa CO, 5 Pa CH_4, and $<$ 0.05 Pa H_2O for Environment C; and 50 Pa H_2, 5 Pa CO, 5 Pa CH_4, and 0.15 Pa H_2O for Environment D. Environments A and B were characteristic of low-oxygen potential.

2104 Power Reactors, Non-breeding, Otherwise Moderated Or Unmoderated

REFER ALSO TO CITATION(S) 18629

2105 Power Reactors, Breeding

REFER ALSO TO CITATION(S) 18612, 18631, 18632, 18633, 18634, 18635, 18636, 18637, 18638, 18639, 18640, 18641, 18642, 18643, 18644, 18645, 18646, 18647, 18648, 18649, 18650, 18651, 18652, 18653, 18654, 18655, 18656, 18657, 18658, 18659, 18660, 18661, 18662, 18663, 18664, 18665, 18666, 18667, 18668, 18669, 18670, 18671, 18672, 18673, 18674, 18675, 18676, 18677, 18678, 18679, 18680, 18681, 18682, 18683, 18684, 18685, 18686, 18687, 18688, 18689, 18690, 18691, 18692, 18693, 18694, 18695, 18696, 18697, 18698, 18699, 18700, 18701, 18702, 18703, 18704, 18705, 18963

18590 (GA-A—15628(Add.)) Gas-cooled fast breeder reactor. Quarterly progress report, August 1-October 31, 1979. (General Atomic Co., San Diego, CA (USA)). Nov 1979. Contract AT03-76SF71023. 45p. NTIS, PC A03/MF A01.

Research is reported on: refueling under pressurized conditions, reactor core, assembly thermal-hydraulic tests, core assembly fabrication development, new shielding concepts, and shielding physics design and analysis. (DLC)

18591 Nuclear reactor composite fuel assembly. Burgess, D.M.; Cappiello, M.W.; Marr, D.R.; Omberg, R.P. (to Department of Energy). US Patent 4,235,669. 25 Nov 1980. Filed date 30 Mar 1978. vp.

PAT-APPL-891673.

A core and composite fuel assembly are described for a liquid-cooled breeder nuclear reactor including a plurality of elongated coextending driver and breeder fuel elements arranged to form a generally polygonal bundle within a thin-walled duct. The breeder elements are larger in cross section than the driver elements, and each breeder element is laterally bounded by a number of the driver elements. Each driver element further includes structure for spacing the driver elements from adjacent fuel elements and, where adjacent, the thin-walled duct. A core made up of the fuel elements can advantageously include fissile fuel of only one enrichment, while varying the effective enrichment of any given assembly or core region, merely by varying the relative number and size of the driver and breeder elements.

18592 Development of techniques for joining fuel rod simulators to test assemblies. Moorhead, A.J.; Reed, R.W. (Oak Ridge Natl Lab, Tenn). *Welding Journal (Miami)* ; **59**: No. 9, 41-50(Sep 1980).

Fuel rod simulators have the same diameter and function as fuel rods in a nuclear reactor but accomplish this through resistance heating of a spirally wound metallic ribbon. An alternate method, based on a gas tungsten arc heating source, has been developed in place of electron beam welding for joining simulators to the tubesheets of test bundles. A modified electrode carrier was built for brazing electrical leads to the tubular conductors extending from the ends of the simulators. 7 refs.

18593 Retrievable fuel pin end member for a nuclear reactor. Rosa, J.M. (to Dept. of Energy). US Patent Application 175,814. 6 Aug 1980. 18p.

A bottom end member on a retrievable fuel pin secures the pin within a nuclear reactor by engaging on a transverse attachment rail with a spring clip type of action. Removal and reinstallation if facilitated as only axial movement of the fuel pin is required for either operation. A pair of resilient axially extending blades are spaced apart to define a slot having a seat region which receives the rail and having a land region closer to the tips of the blades which is normally of less width than the rail. Thus an axially directed force sufficient to wedge the resilient blades apart is required to emplace or release the fuel pin such force being greater than the axial forces on the fuel pins which occur during operation of the reactor.

18594 In-vessel natural circulation during a hypothetical loss-of-heat-sink accident in the fast flux test facility. Perkins, K.R.; Bari, R.A.; Pratt, W.T. (Brookhaven Natl Lab, Upton, NY). *American Society of Mechanical Engineers, [Paper]* ; No. 79-WA/HT-66, vp(2 Dec 1979).

The capability to remove decay heat from the FFTF core via in-vessel natural circulation has been analyzed for the preboiling phase using a lumped parameter model. The results indicate that boiling will occur in the average fuel assembly for a wide spectrum of initial conditions which apear to be representative of the hypothetical loss-of-heat-sink accident. Two-phase pressure drop calculations indicate that, once the saturation temperature is reached, coolability can only be assured for decay heat levels which are less than 0.5 percent of the operating power. 19 refs.

2107 Regulation And Licensing

REFER ALSO TO CITATION(S) 18623

2108 Economics

REFER ALSO TO CITATION(S) 18089, 18225, 18579, 18585, 18764

18595 (DOE/ET/33025—1) Competitive economics of nuclear power. Hellman, R. (Rhode Island Univ., Kingston (USA)). 2 Mar 1981. Contract AS02-77ET33025. 137p. NTIS, PC A07/MF A01.

Some 12 components of a valid study of the competitive economics of a newly ordered nuclear power plant are identified and explicated. These are then used to adjust the original cost projections of four authoritative studies of nuclear and coal power economics.

18596 Methodological approach to nuclear licensee performance evaluation. Chakoff, H.E.; Speaker, D.M.; Thompson, S.R.; Cohen, S.C. (Teknekron Research, Inc., McLean, VA). *Nuclear Safety* ; **22**: No. 1, 78-87(Jan 1981).

The importance of the man-machine interface in nuclear power-plant operation has received increasing attention since the Three Mile Island accident. This article summarizes a methodology for analyzing licensee performance that focuses on the role of the human element in influencing its quality.

2109 Process Heat Reactors

REFER ALSO TO CITATION(S) 18981

18597 **(DOE/ET/35202—T1(Vol.1)) Pebble Bed Reactor Plant screening evaluation. Overall plant and reactor system.** (General Electric Co., Sunnyvale, CA (USA). Advanced Reactor Systems Dept.). Nov 1979. Contract AC02-77ET35202. 483p. NTIS, PC A21/MF A01.

This report consists of three volumes which describe the design concepts and screening evaluation for a 3000 MW(t) Pebble Bed Reactor Multiplex Plant (PBR-MX). The Multiplex plant produces both electricity and transportable chemical energy via the thermochemical pipeline (TCP). The evaluation was limited to a direct cycle plant which has the steam generators and steam reformers in the primary circuit. Volume 1 reports the overall plant and reactor system and was prepared by the General Electic Company. Core scoping studies were performed which evaluated the effects of annular and cylindrical core configurations, radial blanket zones, burnup, and ball heavy metal loadings. The reactor system, including the PCRV, was investigated for both the annular and cylindrical core configurations.

22 NUCLEAR REACTOR TECHNOLOGY

2201 Theory And Calculation

18598 **(BNL—28902) Two-lump fission product model for fast reactor analysis.** Atefi, B. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 7p. (CONF-810606—15). NTIS, PC A02/MF A01.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

As a part of the Fast-Mixed Spectrum Reactor (FMSR) Project, a study was made on the adequacy of the conventional fission product lump models for the analysis of the different FMSR core concepts. A two-lump fission product model consisting of an odd-A fission product lump and an even-A fission product lump with transmutation between the odd- and even-A lumps was developed. This two-lump model is capable of predicting the exact burnup-dependent behavior of the fission products within a few percent over a wide range of spectra and is therefore also applicable to the conventional fast breeder reactor.

2202 Components And Accessories

REFER ALSO TO CITATION(S) 18962

18599 **(LA-UR—80-2525) Nonlinear response of a post-tensioned concrete structure to static and dynamic internal-pressure loads.** Butler, T.A.; Bennett, J.G. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 33p. (CONF-810601—2). NTIS, PC A03/MF A01.

From ADINA conference; Cambridge, MA, USA (10 Jun 1981).

A nonlinear finite element model of a nuclear power plant containment building was developed to determine its ultimate pressure capability under quasistatic and impulsive dynamic loads. The ADINA finite element computer code was used to develop the model because of its capability to handle concrete cracking and crushing. Results indicate that, even though excessive concrete cracking occurs, failure is ultimately caused by rupture of post-tensioning tendons.

18600 **Heat exchanger with auxiliary cooling system.** Coleman, J.H. (to Department of Energy). US Patent 4,235,284. 25 Nov 1980. Filed date 16 Dec 1976. vp.

PAT-APPL-751430.

A heat exchanger with an auxiliary cooling system is described which is capable of cooling a nuclear reactor should the normal cooling mechanism become inoperable. A cooling coil is disposed around vertical heat transfer tubes that carry secondary coolant therethrough and is located in a downward flow of primary coolant that passes in heat transfer relationship with both the cooling coil and the vertical heat transfer tubes. A third coolant is pumped through the cooling coil which absorbs heat from the primary coolant which increases the downward flow of the primary coolant thereby increasing the natural circulation of the primary coolant through the nuclear reactor.

2203 Fuel Elements

REFER ALSO TO CITATION(S) 18688, 18689

18601 **Overview on rod-bundle thermal-hydrauiic analyses.** Sha, W.T. (Argonne National Lab., IL (USA). Components Technology Div.). *Nuclear Engineering and Design ;* **62**: No. 1-3, 1-24(Dec 1980).

Three methods used in rod-bundle thermal-hydraulic analysis are summarized. These methods are: (1) subchannel analysis, (2) porous medium formulation with volume porosity, surface permeability, distributed resistance and distributed heat source (sink) and, (3) bench-mark rod-bundle thermal-hydraulic analysis using a boundary-fitted coordinate system. Basic limitations and merits of each method are delineated.

18602 **Some recent computations of rod bundle thermal hydraulics using boundary fitted coordinates.** Chen, B.C.J.; Vanka, S.P.; Sha, W.T. (Argonne National Lab., IL (USA)). *Nuclear Engineering and Design ;* **62**: No. 1-3, 123-135(Dec 1980).

In this paper, we report the status of development of two computer codes for bench mark rod bundle thermal hydraulic analysis using the boundary-fitted coordinate method. A classification of the flow in rod bundles is made and details of two computer codes are given. The two codes solve essentially identical sets of conservation of mass, momentum and energy, but one of them treats the fully-elliptic set of equations, and the other neglects the axial diffusion of momentum and heat. The neglect of streamwise diffusion makes the flow partially-elliptic, and brings significant reductions in computer storage, and modest savings in required computer time. Results of some validation calculations are presented with applications to reactor geometries.

18603 **Hydraulic characteristics of wire-wrapped rod bundles.** Bishop, A.A. (Pittsburgh Univ., PA (USA). Dept. of Chemical/Petroleum Engineering); Todreas, N. (Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Nuclear Engineering). *Nuclear Engineering and Design ;* **62**: No. 1-3, 271-293(Dec 1980).

Existing hydraulic data such as pressure fields, velocity fields, friction factors, flow split and sweeping flows were reviewed and summarized. In addition equations were suggested to calculate subchannel friction factors, flow split and flow sweeping. It was concluded that sufficient data and analysis exist to generate a complete physical model to characterize turbulent flow in wire-wrapped rod bundles; there are inadequate data to construct a physical model to describe laminar and natural circulation flow. Potential hydraulic problems related to rod bundle dimensional tolerances, non-nominal and/or time-dependent pressure drop characteristics should be resolved.

2204 Control Systems

18604 **Light-water-reactor diagnostic experience using noise analysis.** Ball, R.M.; Huzdovich, J.M. (Babcock and Wilcox Co., Lynchburg, VA). *Nuclear Safety ;* **22**: No. 1, 43-55(Jan 1981).

Random noise in systems, processes, and analog signals has been studied for more than a decade, with a few successful applications demonstrating the value of noise and vibration technology in solving or defining engineering problems. More recently, application engineering has become a substantial part of the technology and, coupled with continuing detailed investigation, has resulted in valid techniques and systems, which are becoming a part of an electric generating station's operations. Additionally, the technology is finding application to somewhat unique problems with potential for expansion into a plantwide diagnostic system. The evolution to date has resulted in technique, hardware, and experienced personnel

throughout the utility industry to such an extent that a major change in the level of application is becoming evident.

2205 Environmental Aspects

REFER ALSO TO CITATION(S) 19214

18605 (ORAU/IEA—80-3(P), pp 57-60) **Siting. A policy based on expansion of existing sites.** Burwell, C.C. Mar 1980. NTIS, PC A11/MF A01.

In Acceptable future nuclear energy system. Gatlinburg II condensed workshop proceedings, December 10-12, 1979, Gatlinburg, Tennessee.

The feasibility of utilizing existing nuclear power plant sites to handle the planned additional nuclear power plants is discussed.

18606 (ORAU/IEA—80-3(P), pp 61-65) **Siting. Regional and state roles in nuclear siting.** Pasternak, A.D. Mar 1980. NTIS, PC A11/MF A01.

In Acceptable future nuclear energy system. Gatlinburg II condensed workshop proceedings, December 10-12, 1979, Gatlinburg, Tennessee.

The Palo Verde nuclear project in Arizona is reviewed. Issues concerning the potential of a 10 to 20 gigawatt electric power center, are discussed.

18607 (ORAU/IEA—80-3(P), pp 65-70) **Siting. NRC perspectives on nuclear siting.** Goller, K.R. Mar 1980. NTIS, PC A11/MF A01.

In Acceptable future nuclear energy system. Gatlinburg II condensed workshop proceedings, December 10-12, 1979, Gatlinburg, Tennessee.

Recommendations of the US Nuclear Regulatory Commission on the siting of nuclear power plants are presented.

18608 (ORAU/IEA—80-3(P), pp 86-90) **Siting. Energy centers in the northwest.** Robinson, R.K. Mar 1980. NTIS, PC A11/MF A01.

In Acceptable future nuclear energy system. Gatlinburg II condensed workshop proceedings, December 10-12, 1979, Gatlinburg, Tennessee.

Considerations for siting energy centers in the Pacific Northwest are presented.

18609 (ORAU/IEA—80-3(P), pp 90-98) **Siting. Policy implications of nuclear siting.** Gibbons, J.H. Mar 1980. NTIS, PC A11/MF A01.

In Acceptable future nuclear energy system. Gatlinburg II condensed workshop proceedings, December 10-12, 1979, Gatlinburg, Tennessee.

Strategies used for siting nuclear power plants are reviewed.

18610 Draft environmental impact statement. Susquehanna Steam Electric Station, Units 1 and 2 (Supplement). Washington, DC; Nuclear Regulatory Commission (1980). 70p. (NUREG—0564). Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC. (MF or HC) Order No. 79-0656.

Construction of a water storage reservoir in Pond Hill Creek, a small tributary of the Susquehanna River in Conyngham Township, Luzerne County, Pennsylvania, is propsed. This statement supplements the draft environmental impact statement of June 1979 concerning the operation of Susquehanna Steam Electric Station Units 1 and 2. The reservoir facility, which would supply water to the Susquehanna River during periods of low riverflow to replace water used by the station, would consist of a dam, extending 730 meters, rising 67 meters above the streambed, and creating a reservoir with a surface area of 128 hecacres and a capacity of 24,100 acre-feet. Appurtenant facilities would include an inlet outlet structure, water conduit, pumping plant, intake structure, and 1220-meter access road. The facility would have the capacity to discharge water at a rate of 3.0 cubic feet per second (cfs) during periods of low river flow, and normal discharge rate would range between 1.4 cfs and 1.8 cfs. By augmenting low flows the reservoir facility would mitigate the impacts of water consumption during operation of the plant. Approximately 145 hecacres of land surrounding the reservoir would become available for use by hunters and hikers and the lake itself would offer recreational opportunities. Approximately 195 hecacres of land including 128 hecacres of forest, and 2.3 kilometers of the creek would be displaced by the reservoir and the appearance of the valley and the creek would be permanently altered. Fluctuating water levels would result in exposed mudflats and could alter the aquatic environment created by the impoundment. The quality of water in the Pond Creek flow below the dam would decline somewhat.

18611 Draft environmental impact statement. Palo Verde Nuclear Generating Station Units 4 and 5. Washington, DC; Nuclear Regulatory Commission (1979). 291p. (NUREG—0522). Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC. (MF or HC) Order No. 79-0656.

Construction by the Arizona Public Services Company of the Palo Verde Nuclear Generating Station Units 4 and 5, located 15 miles west of Buckeye, Arizona, is proposed. Each unit would employ a pressurized water reactor to produce up to 3817 megawatts thermal that would be used to produce steam to drive steam turbines, providing 1270 megawatts electrical of power capacity. The units would be cooled by cooling towers using makeup water obtained by treating piped sewage effluent from Phoenix. Approximately 13 billion kilowatt-hours of electricity per year would be produced. The two units and related facilities would occupy roughly 1100 acres, and the evaporation pond would occupy approximately 800 acres of agricultural and rural desert land during the 40-year life of the plant. Diversion of effluent from the Ninety-first Avenue sewage-treatment plant would degrade existing downstream riparian habitat along the Gila River.

2206 Research, Test, And Experimental Reactors

REFER ALSO TO CITATION(S) 18594, 18968

2209 Reactor Safety

REFER ALSO TO CITATION(S) 18570, 18594, 19214, 19378

18612 (ANL—81-9) ICECO-CEL: a coupled Eulerian-Lagrangian code for analyzing primary system response in fast reactors. Wang, C.Y. (Argonne National Lab., IL (USA)). Feb 1981. Contract W-31-109-ENG-38. 177p. NTIS, PC A09/MF A01.

This report describes a coupled Eulerian-Lagrangian code, ICECO-CEL, for analyzing the response of the primary system during hypothetical core disruptive accidents. The implicit Eulerian method is used to calculate the fluid motion so that large fluid distortion, two-dimensional sliding interface, flow around corners, flow through coolant passageways, and out-flow boundary conditions can be treated. The explicit Lagrangian formulation is employed to compute the response of the containment vessel and other elastic-plastic solids inside the reactor containment. Large displacements, as well as geometrical and material nonlinearities are considered in the analysis. Marker particles are utilized to define the free surface or the material interface and to visualize the fluid motion. The basic equations and numerical techniques used in the Eulerian hydrodynamics and Lagrangian structural dynamics are described. Treatment of the above-core hydrodynamics, sodium spillage, fluid cavitation, free-surface boundary conditions and heat transfer are also presented. Examples are given to illustrate the capabilities of the computer code. Comparisons of the code predictions with available experimental data are also made.

18613 (CONF-810355—1) RELAP5 two-phase fluid model and numerical scheme for economic LWR system simulation. Ransom, V.H.; Wagner, R.J.; Trapp, J.A. (Idaho National Engineering Lab., Idaho Falls (USA)). 1981. Contract AC07-76ID01570. 21p. NTIS, PC A02/MF A01.

From CSNI heat transfer conference; Pasadena, CA, USA (23 Mar 1981).

The RELAP5 two-phase fluid model and the associated numerical scheme are summarized. The experience accrued in devel-

opment of a fast running light water reactor system transient analysis code is reviewed and example of the code application are given.

18614 **(EGG-IS—5341) Interactive reliability analysis project. FY 80 progress report.** Rasmuson, D.M.; Shepherd, J.C. (EG and G Idaho, Inc., Idaho Falls (USA)). Mar 1981. Contract AC07-76ID01570. 37p. (ALO—138). NTIS, PC A03/MF A01.

This report summarizes the progress to date in the interactive reliability analysis project. Purpose is to develop and demonstrate a reliability and safety technique that can be incorporated early in the design process. Details are illustrated in a simple example of a reactor safety system.

18615 **(LA-UR—81-875) Numerical study of hot-leg ECC injection into the upper plenum of a pressurized water reactor.** Daly, B.J.; Torrey, M.D.; Rivard, W.C. (Los Alamos National Lab., NM (USA); Flow Science, Inc., Los Alamos, NM (USA)). 1981. Contract W-7405-ENG-36. 19p. (CONF-810307—2). NTIS, PC A02/MF A01.

From 3. specialist meeting on transient two-phase flow; Pasadena, CA, USA (23 Mar 1981).

In certain pressurized water reactor (PWR) designs, emergency core coolant (ECC) is injected through the hot legs into the upper plenum. The condensation of steam on this subcooled liquid stream reduces the pressure in the hot legs and upper plenum and thereby affects flow conditions throughout the reactor. In the present study, we examine countercurrent steam-water flow in the hot leg to determine the deceleration of the ECC flow that results from an adverse pressure gradient and from momentum exchange from the steam by interfacial drag and condensation. For the parameters examined in the study, water flow reversal is observed for a pressure drop of 22 to 32 mBar over the 1.5 m hot leg. We have also performed a three-dimensional study of subcooled water injection into air and steam environments of the upper plenum. The ECC water is deflected by an array of cylindrical guide tubes in its passage through the upper plenum. Comparisons of the air-water results with data obtained in a full scale experiment shows reasonable agreement, but indicates that there may be too much resistance to horizontal flow about the columns because of the use of a stair-step representation of the cylindrical guide tube cross section. Calculations of flow past single columns of stair-step, square and circular cross section do indicate excessive water deeentrainment by the noncircular column. This has prompted the use of an arbitrary mesh computational procedure to more accuratey represent the circular cross-section guide tubes. 15 figures.

18616 **(LMF—70) Characterization of an aerosol sample from Three Mile Island Reactor auxiliary building.** Kanapilly, G.M.; Stanley, J.A.; Newton, G.J.; Wong, B.A.; DeNee, P.B. (Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (USA)). Jan 1981. Contract AC04-76EV01013. 13p. NTIS, PC A02/MF A01.

The accident which occurred at the Three Mile Island Unit Two Nuclear Generating Plant on March 28, 1979 resulted in contamination of the containment and auxiliary buildings. Analyses were performed for: (1) radioisotopic composition and (2) dissolution characteristics of material collected on a filter during a week of continuous air sampling in the auxiliary building. This work was done to help characterize the environment in which cleanup operations are being performed. Gamma and alpha spectroscopy along with scanning electron microscopy were employed to determine the elemental and isotopic composition of the aerosol. The major radioisotopes found on the filter were ^{89}Sr, ^{90}Sr, ^{134}Cs and ^{137}Cs. Dissolution behavior of the aerosol in a synthetic serum ultrafiltrate containing DTPA was determined using both static and flow-through systems.

18617 (ORAU/IEA—80-3(P), pp 2-8) **Setting the stage. Statement of the issues.** Weinberg, A.M. Mar 1980. NTIS, PC A11/MF A01.

In Acceptable future nuclear energy system. Gatlinburg II condensed workshop proceedings, December 10-12, 1979, Gatlinburg, Tennessee.

Aspects of nuclear power plant safety are presented concerning technical fixes; confined-siting policy; and structure of the nuclear utility industry.

18618 (ORAU/IEA—80-3(P), pp 9-22) **Setting the stage. Response of the utility industry.** Lewis, F.W. Mar 1980. NTIS, PC A11/MF A01.

In Acceptable future nuclear energy system. Gatlinburg II condensed workshop proceedings, December 10-12, 1979, Gatlinburg, Tennessee.

The response to the Three Mile Island-2 reactor accident by the utility industry was coordinated through the TMI Ad Hoc Nuclear Oversight Committee. Activities of the committee are reviewed.

18619 (ORAU/IEA—80-3(P), pp 23-31) **Setting the stage. Response of the Tennessee Valley Authority.** Green, H.J. Mar 1980. NTIS, PC A11/MF A01.

In Acceptable future nuclear energy system. Gatlinburg II condensed workshop proceedings, December 10-12, 1979, Gatlinburg, Tennessee.

The nuclear power program of the Tennessee Valley Authority is reviewed. Actions taken by TVA to reassure the safety of their nuclear power plants following the Three Mile Island-2 reactor accident are described.

18620 (ORAU/IEA—80-3(P), pp 31-41) **Setting the stage. Kemeny Commission conclusions.** Pigford, T.H. (Univ. of California, Berkeley). Mar 1980. NTIS, PC A11/MF A01.

In Acceptable future nuclear energy system. Gatlinburg II condensed workshop proceedings, December 10-12, 1979, Gatlinburg, Tennessee.

Findings of the Kemeny Commission on the Three Mile Island-2 reactor accident are reviewed by one of the Commission members.

18621 (ORAU/IEA—80-3(P), pp 41-55) **Setting the stage. The President's response to the Kemeny Commission report.** Meserve, R. Mar 1980. NTIS, PC A11/MF A01.

In Acceptable future nuclear energy system. Gatlinburg II condensed workshop proceedings, December 10-12, 1979, Gatlinburg, Tennessee.

The response of the President of the US to the recommendations of the Kemeny Commission is reviewed. Special emphasis is placed on the recommendations concerning the US Nuclear Regulatory Commission.

18622 **(SAND—81-0109C) Reactor safety study methodology applications program: Oconee results.** Hatch, S.W.; Kolb, G.J. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 6p. (CONF-810606—5). NTIS, PC A02/MF A01.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

To determine the public risk due to light water reactors, the Reactor Safety Study (RSS) developed a methodology for evaluating nuclear reactor safety. The Reactor Safety Study Methodology Applications Program was divided into two principal tasks: systems analysis of engineered systems, and analysis of the accident processes. The study includes risk assessments of one boiling water reactor and three pressurized water reactor power plants. The plants, selected by the NRC, differ from the two plants studied in the RSS and are representative of current technology. Results for the second plant selected, the Oconee No. 3 PWR, are presented.

18623 **(SAND—81-0112C) Effects on NRC regulations and regulatory guides of considering degraded core accidents.** Elliott, J.M.; Immerman, W.H.; Kolaczkowski, A.M.; Quinn, J.A. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 8p. (CONF-810606—2). NTIS, PC A02/MF A01.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

A review was performed for the Office of Standards Development, NRC, of Title 10 of the Code of Federal Regulations (CFR) and NRC Regulatory Guides. This review was to determine to what extent these portions of the NRC regulatory base would have to be changed to include degraded core accidents in the licensing process. The review focused on 10 CFR Parts 50, 55, and

100, and the Division 1 Regulatory Guides, although other sections of these documents also were examined. This study identifies those changes that could be mandated due to the direct conflict of existing regulations with the concept of a degraded core rule or with its basis.

18624 (SAND—81-0920C) Interim/National Reliability Evaluation Programs. Carlson, D.D.; Bernero, R.M. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 4p. (CONF-810454—1). NTIS, PC A02/ MF A01.

From Atomic industrial forum licensing workshop; New Orleans, LA, USA (14 Apr 1981).

Since the accident at Three Mile Island, there has been increasing interest throughout the US Nuclear Regulatory Commission (NRC) and the industry at large in the use of probabilistic risk assessment techniques. As a result, the Office of Nuclear Regulatory Research contracted with Sandia National Laboratories to perform the Interim Reliability Evaluation Program (IREP). This program is to develop procedures for performing probabilistic risk assessments and to apply them to several operating reactors. Subsequent to the beginning of IREP, a broader effort to develop PRA procedures has been undertaken by the NRC in cooperation with the American Nuclear Society (ANS) and the Institute of Electrical and Electronic Engineers (IEEE). This broader effort is to develop an Industry/ NRC PRA Procedures Guide. This latter guide is sometimes referred to as the NREP Procedures Guide, NREP standing for National Reliability Evaluation Program.

18625 (UCID—18955) Material presented to advisory committee on reactor safeguards, subcommittee on extreme external phenomena, January 29-30, 1981, Los Angeles, California. Seismic safety margins research program. Smith, P.D.; Bernreuter, D.L.; Bohn, M.P.; Chuang, T.Y.; Cummings, G.E.; Dong, R.G.; Johnson, J.J.; Wells, J.E. (Lawrence Livermore National Lab., CA (USA)). Jan 1981. Contract W-7405-ENG-48. 295p. NTIS, PC A13/MF A01.

The January 29-30, 1981, meeting of the Advisory Committee on Reactor Safeguards (ACRS), Subcommittee on Extreme External Phenomena, mark the close of Phase I efforts on the Seismic Safety Margins Research Program (SSMRP). Presentations at the meeting focused on results produced. These included computer codes, response computations, failure and release probabilities, data bases, and fragilities and parameter characteristics.

18626 Nuclear Safety Analysis Center. Zebroski, E.L. (Electric Power Research Inst., Palo Alto, CA); Leverett, M.C. *Nuclear Safety ;* **22**: No. 1, 1-9(Jan 1981).

Immediately after the Three Mile Island (TMI) accident, the US utility industry asked the Electric Power Research Institute (EPRI) to set up a Nuclear Safety Analysis Center (NSAC) charged with analyzing the accident, deriving lessons to be learned from it, and performing other safety-related functions. Financed by industry subscriptions and staffed with a nucleus of EPRI employees, with loaned employees from utility companies, reactor manufacturers, national laboratories, and other industries, NSAC now has 35 to 40 professionals. The NSAC's present program is a natural outgrowth of its TMI investigation and involves: evaluation of significant plant operating events; nuclear power plant experience case studies; response to regulatory issues; generic safety studies; technical and operating information clearinghouse; and strategic analysis. The NSAC is fulfilling a need that probably existed in the industry for many years before the TMI accident and is expected to exist indefinitely.

18627 New trends in the evaluation and implementation of the safety-related operating experience associated with NRC-licensed reactors. Michelson, C.; Heltemes, C.J. (Nuclear Regulatory Commission, Washington, DC). *Nuclear Safety ;* **22**: No. 1, 10-20(Jan 1981).

This article is an overview of the Nuclear Regulatory Commission program for the evaluation and dissemination of the safety-related operating experience associated with all NRC-licensed reactors. It discusses the historical background and past problems that led to the recent formation of NRC's Office for Analysis and Evaluation of Operational Data (AEOD) and details its activities, organization, staffing, and proposed analysis and evaluation methodology. The programs of industry organizations and nuclear plant licensees and the integration of foreign operating experience are included in the overview. The problems and limitations of the Licensee Event Report (LER) program and the Nuclear Plant Reliability Data system program are discussed. The AEOD analysis and evaluation methodology program includes some new improvements in the assessment of safety-related operating experience. Of particular note is the sequence coding and search procedure being developed by AEOD under a contract with the Nuclear Safety Information Center at the Oak Ridge National Laboratory. This computer-based retrieval system will have markedly improved search strategy capability for such items as commoncause failures or complex system interactions involving various failure sequences and other relationships associated with an event. The system retrieves failure data and information on the principal LER occurrence and on related component and system responses. The computer-generated Power Reactor Watch List enables AEOD to monitor all critical or unusual situations warranting close attention because of potential public health and safety. This listing is supported by a preestablished computer search strategy of the historical data base permitting identification of all past events and statistical information that are applicable to the situation being watched.

18628 Characterization and evaluation of uncertainty in probabilistic risk analysis. Parry, G.W.; Winter, P.W. (UKAEA Safety and Reliability Directorate, Culcheth). *Nuclear Safety ;* **22**: No. 1, 28-42(Jan 1981).

The sources of uncertainty in probabilistic risk analysis are discussed, using the event and fault-tree methodology as an example. The role of statistics in quantifying these uncertainties is investigated. A class of uncertainties is identified which are, at present, unquantifiable using either classical or Bayesian statistics. it is argued that Bayesian statistics is the more appropriate vehicle for the probabilistic analysis of rare events, and a short review is given with some discussion on the representation of ignorance.

18629 Accident at the experimental nuclear power station in Lucens. Fritzsche, A.F. *Nuclear Safety ;* **22**: No. 1, 87-102(Jan 1981).

Results of investigations of the 1969 accident which occurred at the experimental nuclear power station in Lucens, Switzerland, are reported. The chain of events was extremely complex, and the determination of the primary cause was rendered difficult because no advanced indications were observed at the time. This disquieting fact was explored and is explained in detail. Despite the fact that one fuel element was destroyed and the core of the reactor was seriously damaged, the radioactivity released constituted a negligible exposure for the public. The lessons learned from this accident which are relevant to today's reactors are discussed.

18630 Quench front modeling and reflood heat transfer in COBRA-TF. Kelly, J.M. (Battelle, Pac Northwest Lab, Richland, Wash). *American Society of Mechanical Engineers, [Paper] ;* No. 79-WA/HT-63, vp(2 Dec 1979).

COBRA-TF, a two-fluid subchannel analysis code, is being developed at PNL. As part of that development, a "fine mesh-rezoning" quench front model has been developed to overcome the numerical difficulties associated with simulating reflood heat transfer with large axial computational mesh spacing. Detailed representations of the surface heat flux and temperature profiles in the vicinity of the quench front are realized by overlaying a variable fine mesh upon the coarse hydrodynamic noding. This approach allows for the inclusion of axial conduction in the rod temperature solution and the integration over the fine mesh noding to determine the heat release for a hydrodynamic cell. 10 refs.

18631 Methods of predicting fuel failure--development and evaluation. Klickman, A.E.; Bauer, T.H.; Hughes, T.H.; Kramer, J.M.; Lo, R.K.; Meek, C.C.; Page, R.J.; Person, L.W. (Argonne Natl Lab, Ill). pp 944-952 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

Two new fuel pin thermal-mechanical analysis codes have been developed for use in hypothetical accident and related experi-

ment analysis. One of these, FPIN, models an entire fuel pin for axisymmetric situations. The other, FSTATE, affords a two-dimensional modeling capability for one axial segment with azimuthal asymmetry. 7 refs.

18632 Influence of TREAT nonprototypic effects on prediction of pin failure in LMFBRs. Mast, P.K.; Scott, J.H. (Los Alamos Sci Lab, NM). pp 953-962 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

The effect of the nonprototypic stagnant coolant environment in the static-capsule TOP TREAT (Transient Reactor Test) tests has been investigated using the LAFM code. The cladding temperature was shown to be higher relative to the fuel temperature for the simulated 50/cent/sub s/ transients than in a hypothetical 50/cent/sub s/ FTR transient. This higher relative cladding temperature significantly decreases the importance of fuel-cladding differential thermal expansion as a failure mechanism and causes concern about the direct applicability of the 50/cent/sub s/ static-capsule TREAT test results to hypothetical FTR transients. 12 refs.

18633 Predicted and measured temperature profiles in a fueled subassembly in EBR-II. Betten, P.R.; Tokar, J.V.; Chang, L.K.; Gillette, J.L.; Singer, R.M. (Argonne Natl Lab, Ill). pp 963-971 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

The article presents temperature predictions obtained by the thermal-hydraulics codes THI3D, COBRA-4, and CLUSTER with measured temperatures obtained from the instrumented subassembly XX08 during steady-state, full-power, and full-flow conditions of EBR-II run 90B. Since in-core LMFBR data are extremely scarce, it is hoped that the data presented here will further verify computer codes and reduce uncertainties in the thermal-hydraulic design, analysis, and safety requirements of LMFBR subassemblies. 10 refs.

18634 LIMBO model for interpreting and predicting voiding dynamics in LMFBR safety tests. Bordner, G.L. (Argonne Natl Lab, Ill). pp 972-980 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

This report describes the LIMBO (LIquid Metal BOiling) code for analyzing two-phase flow phenomena in an LMFBR reactor coolant channel. This code was intended to be simple, efficient, and easy-to-use and therefore to be particularly suited for conducting parametric studies and evaluating model or correlation changes. Model predictions are compared with data from in-pile LMFBR safety experiments. 10 refs.

18635 Detection of coolant boiling in the dfr during special fuel experiments. Dawson, D.G.; Rowley, R. (UKAEA, Warrington, Cheshire, Engl). pp 981-990 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

In a series of special experiments, 8 fuel assemblies (3 pin and 18 pin, some with artificial blockages) were deliberately overheated and liquid metal boiling occurred. The boiling was monitored continuously by two techniques. The experiments were controlled during the approach to boiling by measurement of the coolant temperature differential across the assemblies. Confirmation of coolant boiling and control of the experiments during the boiling phase was by the analysis of acoustic and thermal noise. 7 refs.

18636 PINEX-2 experiment: concept verification of an inherent shutdown mechanism for HCDA's. Porten, D.R.; Padilla, A. Jr.; Baars, R.E.; Randklev, E.H.; Culley, G.E. (Hanford Eng Dev Lab, Richland, Wash). pp 991-1000 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

PINEX-2 was a dual-objective experiment to continue development of the Pinhole Imaging (PINEX) system for monitoring fuel motion, and to further demonstrate the feasibility of internal fuel motion as a mechanism for mitigating the consequences of hypothetical LMFBR accidents. A special fuel pin with a pre-fabricated central hole in the fuel, insulator, and reflector was pre-irradiated in the General Electric Test Reactor and subjected to a simulated 5;/sec transient overpower excursion in the Transient Reactor Test (TREAT) facility. Approximately 10 grams of molten fuel were ejected upward from the fuel region into the reflector and fission gas plenum without failure of the fuel pin cladding. 9 refs.

18637 Prompt Burst Energetics (PBE) experiment analyses using the SIMMER-II computer code. Tomkins, J.L.; Hitchcock, J.T.; Young, M.F. (Los Alamos Sci Lab, NM). pp 1001-1010 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

Two of the Prompt Burst Energetics (PBE) in-pile experiments conducted at Sandia Laboratories, PBE-5S and PBE-SG2, have been investigated with SIMMER-II. These two tests utilize fresh uranium oxide and fresh uranium carbide pins, respectively, in stagnant sodium. The purpose of the analysis is to investigate the applicability of SIMMER-II to this type of experiment. 8 refs.

18638 Study of the dispersive potential of irradiated fuel using in-core experiments. Worledge, D.H.; Cano, G.L. (Sandia Lab, Albuquerque, NM). pp 1011-1020 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

A fuel disruption experiment at Sandia Laboratories exhibited rapid disruption probably below but near the fuel melt temperature. The fuel was being heated at 130K/msec when vigorous dispersal occurred in the hottest regions near the fuel melting point. Fuel vapor could not have been responsible. Dispersal is attributed to rapid release of fission product gases under the prompt burst conditions. Further tests are planned to explore this important phenomenon. 13 refs.

18639 Fission gas behavior in mixed-oxide fuel during transient overpower. Randklev, E.H.; Treibs, H.A.; Mastel, B.; Baldwin, D.L. (Hanford Eng Dev Lab, Richland, Wash). pp 1021-1032 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

Fission gas behavior can be important in determining fuel pin and core performance during a reactor transient. This paper presents the results of examinations characterizing the changes in microstructural distribution and retention of fission gas in fuel for a series of transient overpower (50/cent/sub s/) tested mixed oxide fuel pins and their steady state siblings. 16 refs.

18640 Prompt burst energetics in the oxide/sodium system. Reil, K.O.; Young, M.F. (Sandia Lab, Albuquerque, NM). pp 1033-1042 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

A series of twelve Prompt Burst Energetics (PBE) experiments utilizing fresh uranium dioxide fuel pins in stagnant sodium coolant has been performed in Sandia Laboratories' Annular Core Pulse Reactor. This paper presents results of this series of experiments and related analysis and the conclusions drawn about prompt burst energetics in the oxide/sodium system. 9 refs.

18641 Kinetics of fission-vaporized UO_2 fuel determined from sampled fuel debris. Elrick, R.M. (Sandia Lab, Albuquerque, NM). pp 1043-1051 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

Close-in time-resolved sampling of fuel "aerosols", high speed photography, and photometric measurement of fuel temperatures were used to determine the thermal and kinetic characteristics of UO/sub 2/ fission heated to vaporization. From the data it was possible to obtain energy temperature relations and debris kinetics including particle size, velocity, density, momentum and pressure. The results demonstrate techniques for study of dynamic interactions involving liquid and vapor between fuel, cladding, coolant and structure and produce data important for determining initial HCDA aerosol formation. 4 refs.

18642 Analysis of Sandia in-pile EOS experiments. Breitung, W.; Gorham-Bergeron, E.; Murata, K.K. (Sandia Lab, Albuquerque, NM). pp 1059-1068 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

Preliminary analysis has been carried out of the dynamic in-pile equation-of-state measurements for UO/sub 2/, conducted at Sandia Laboratories, aimed at reducing the uncertainties in the effective UO/sub 2/ enthalpy corresponding to the measured pressures. Of the remaining width of the p-H band of some 350 J/g, about 200 J/g originate in the uncertainties of the analytical modelling abd about 150 J/g result from the scatter in the experimental data. 12 refs.

18643 LMFBR accident delineation study: approach and preliminary results. Williams, D.C.; Sholtis, J.A.; Rios, M.; Worledge, D.H.; Conrad, P.W.; Varela, D.W.; Pickard, P.S. (Sandia Lab, Albuquerque, NM). pp 1122-1132 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

Event trees have been constructed for all phases of LMFBR accidents. The trees proved useful for identifying meaningful initiating accident categories and containment responses. In these areas, quantification appears feasible, given an adequate data base. The delineation served to systematize LMFBR safety issues and should aid in evaluating LMFBR RandD priorities. 8 refs.

18644 Probabilistic model of risk of a single nuclear reactor. Derby, S.L.; Temme, M.I.; El-Sheikh, K.A. (Appl Decis Anal Inc, Menlo Park, Calif). pp 1143-1152 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

A consistent probabilistic model of risk for a single nuclear reactor is developed. The model gives a basis for treating uncertainties systematically and correctly, and avoids underestimating the risk for low probability events. An illustrative example demonstrates the application of the model to the Clinch River Breeder Reactor. 5 refs.

18645 Influence of restoration on standby control rod reliability goals. Crellin, G.L.; Wood, A.P. (GE, Sunnyvale, Calif). pp 1172-1180 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

The reliability of a system of standby control rods subject to restoration prompted by challenges to the system is modeled by a Markovian approach. The model is then used to determine realistic reliability goals for the control rods. It is concluded that the inclusion of restoration in the allocation procedure allows the establishment of goals which are easier to statistically demonstrate by testing. 2 refs.

18646 CRBRP structural and thermal margin beyond the design base. Strawbridge, L.E. (Westinghouse Electr Corp, Madison, Pa). pp 1230-1240 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

Prudent margins beyond the design base have been included in the design of Clinch River Breeder Reactor Plant to further reduce the risk to the public from highly improbable occurrences. These margins include Structural Margin Beyond the Design Base to address the energetics aspects and Thermal Margin Beyond the Design Base to address the longer term thermal and radiological consequences. The assessments that led to the specification of these margins are described, along with the experimental support for those assessments. 8 refs.

18647 FFTF containment of hypothetical accidents. Peak, R.D.; Martin, H.C.; Jensen, R.L.; Stepnewski, D.D.; Hale, J.P. (Hanford Eng Dev Lab, Richland, Wash). pp 1241-1250 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

The FFTF facility was evaluated for the consequences of an HCDA followed by failure of in-vessel post-accident heat removal, reactor vessel melt-through, and release of core debris and sodium coolant to the reactor cavity. Two cases are presented based on parameters considered to represent upper limits for rates of chemical and thermal attack of the reactor cavity concrete containment structure. The reactor containment building temperature, pressure, and leak rate histories were computed with the CACECO code which provided input into the HAA-3C code for prediction of aerosol behavior, and to the COMRADEX-H code for prediction of radioactivity dispersion. 10 refs.

18648 Single-phase sodium pump model for LMFBR thermal-hydraulic analysis. Madni, I.K.; Cazzoli, E.G.; Agrawal, A.K. (Brookhaven Natl Lab, Upton, NY). pp 1273-1285 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

A single-phase pump model is developed for transient simulation of LMFBR systems. Pump characteristics are modeled by homologous head and torque relations encompassing all regimes of operation. Results show the model to yield excellent agreement with experimental data in sodium for the FFTF pump, and with vendor calculations for the CRBR pump. A sample pipe rupture calculation is performed to demonstrate the necessity for modeling the complete characteristics. 14 refs.

18649 Response of FFTF core to protected reactivity addition transients. Yee, A.K.; Baars, R.E.; Stepnewski, D.D. (Hanford Eng Dev Lab, Richland, Wash). pp 1306-1315 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

The response of the FFTF core to protected reactivity insertion events was evaluated. Reactivity addition transients ranging from .05/cent/sub s/ to 3;/s have been considered. The evaluation method is based on a calculational model which predicts cladding strain from fuel-cladding differential thermal expansion. Comparisons made between predicted fuel damage and results of TREAT transient tests support the conservatism of the predictions. 4 refs.

18650 Feedback control systems for non-linear simulation of operational transients in LMFBRS. Khatib-Rahbar, M.; Agrawal, A.K.; Srinivasan, E.S. (Brookhaven Natl Lab, Upton, NY). pp 1316-1329 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

Feedback control systems for nonlinear simulation of operational transients in LMFBRs are developed. The models include (1) the reactor power control and rod drive mechanism, (2) sodium flow control and pump drive system, (3) steam generator flow control and valve actuator dynamics, and (4) the supervisory control. These models have been incorporated into the SSC code using a flexible approach, in order to accommodate some design dependent variations. 11 refs.

18651 **Fast reactor test facilities in the US safety program.** Avery, R.; Dickerman, C.E.; Lennox, D.H.; Rose, D. (Argonne Natl Lab, Ill). pp 1367-1379 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

The needs for safety information derivable from in-pile programs are reviewed, and the correlation made with existing and planned capability. In view of the current status of the U.S. breeder program, emphasis is given in the review to the impact of different fast breeder options on the required program and facilities. It is concluded that facility needs are somewhat independent of specific fast breeder concept, even though the relative emphasis on the various safety issues will differ. 8 refs.

18652 **Overview assessment of energetic core disruptive accidents.** Stevenson, M.G.; Bell, C.R.; Bohl, W.R.; Boudreau, J.E.; Burns, R.D. III; Jackson, J.F.; Luck, L.B.; Scott, J.H.; Smith, L.L.; Smith, S.T. (Los Alamos Sci Lab, NM). pp 1406-1414 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

An overview is presented of mechanistic, phenomenological, and probabilistic approaches to analysis of LMFBR accidents involving core disruption. A technical review is made of the current status of the issues involved in disrupted core dynamics, and an assessment is given of the likelihood of potentially damaging excursions. 14 refs.

18653 **Some recriticality studies with SIMMER-II.** Bohl, W.R. (Los Alamos Sci Lab, NM). pp 1415;1424 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

The SIMMER-II code was applied to the problem of evaluating the potential for recriticality in an LMFBR HCDA. The phenomenology examined was based on the post SAS3D behavior in a CRBR LOF accident. The SIMMER-II results were found to be sensitive to the development of fuel blockages. 14 refs.

18654 **Termination phase of core disruptive accidents in LMFBRS.** Saito, M.; Theofanous, T.G. pp 1425-1434 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

Experimental results for nitrogen and low quality water discharges in the Omega facility are presented. It is demonstrated that these results are amenable to simple theoretical interpretations without significantly dissipative mechanisms. Preliminary experimental results on the effects of the upper internal structures are also presented. The existence of substantial dissipation for condensible discharges is indicated. 8 refs.

18655 **Role of similitude in the design of LMFBR safety-related simulation experiments.** Chapyak, E.J.; Starkovich, V.S. (Los Alamos Sci Lab, NM). pp 1435-1444 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

Implications of scaling are examined in the design of simulation experiments for two major areas of fast reactor safety research--the transition phase and postdisassembly energetics. Specific scaling requirements and compatible experimental designs are formulated and compared with ongoing programs having similar objectives. Suggestions are also outlined for future out-of-pile experimental research. 10 refs.

18656 **Studies related to emergency decay heat removal in EBR-II.** Singer, R.M.; Gillette, J.L.; Mohr, D.; Tokar, J.V.; Sullivan, J.E.; Dean, E.M. (Argonne Natl Lab, USA). pp 1590-1598 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

Experimental and analytical studies related to emergency decay heat removal by natural circulation in the EBR-II heat transport circuits are described in this paper. Three general categories of natural circulation plant transients are discussed and the resultant reactor flow and temperature response to these events are presented. These categories include the following: (1) loss of forced flow from decay power and low initial flow rates; (2) reactor scram with a delayed loss of forced flow; and (3) loss of forced flow with a plant protective system activated scram. 5 refs.

18657 **Application of optimal estimation techniques to FFTF decay heat removal analysis.** Nutt, W.T.; Additon, S.L.; Parziale, E.A. (Hanford Eng Dev Lab, Richland, Wash). pp 1627-1636 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

The verification and adjustment of plant models for decay heat removal analysis using a mix of engineering judgment and formal techniques from control theory are discussed. The formal techniques facilitate dealing with typical test data which are noisy, redundant and do not measure all of the plant model state variables directly. Two pretest examples are presented. 5 refs.

18658 **Sodium boiling incoherence in a 19-pin wire-wrapped bundle.** Wantland, J.L.; Garrison, P.W.; Nelson, W.R.; Dearing, J.F.; Gnadt, P.A.; Ribando, R.J.; Fontana, M.H. (Oak Ridge Natl Lab, Tenn). pp 1678-1685 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

A full-length electrically heated 19-pin bundle was used to determine the extent to which dynamic boiling can be sustained before dryout occurs. Over 30 boiling runs were made with runs at three flow-power conditions culminating in dryout. Continuous boiling for time periods exceeding 20 sec was observed. Detailed comparisons of experimental results with the results of several different analytical techniques indicate that incoherent boiling caused by bundle thermal inertia was responsible for the long time periods between boiling inception and dryout. This suggests that thermal inertia designed into the reactor core could prevent or delay core damage during various flow-power mismatch transients. 8 refs.

18659 **Natural convection boiling of sodium in a simulated FBR fuel assembly subchannel.** Garrison, P.W.; Morris, R.H.; Montgomery, B.H. (Oak Ridge Natl Lab, Tenn). pp 1686-1695 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

A series of single-channel sodium boiling experiments was conducted in the Sodium Boiling Test Facility at the Oak Ridge National Laboratory. The objective of these tests was to determine the maximum power that can be transferred to the coolant in a fuel assembly subchannel when the flow is driven by natural convection. The power corresponding to dryout in these tests represents approximately 15% of the Fast Test Reactor average linear power and agrees with results from a low-pressure water simulation of fuel assembly voiding behavior. 6 refs.

18660 Comparison of COBRA III-C and SABRE-1 (wire-wrap version) computational results with steady-state data from a 19-pin internally guard heated sodium-cooled bundle with a six-channel central blockage (THORS bundle 3C). Dearing, J.F.; Nelson, W.R.; Rose, S.D. (Oak Ridge Natl Lab, Tenn). pp 1706-1715 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

Computational thermal-hydraulic models of a 19-pin, electrically heated, wire-wrap liquid-metal fast breeder reactor test bundle were developed using two well-known subchannel analysis codes, COBRA III-C and SABRE-1 (wire-wrap version). Both codes show generally good agreement with experimental temperature data from a test in which a large radial temperature gradient was imposed. Differences between data and code results are probably caused by experimental pin bowing, which is presently the limiting factor in validating coded empirical models. 4 refs.

18661 Results of recent upper plenum injection tests. Spencer, B.W.; Erickson, E.G.; Goldfuss, G.T.; Henry, R.E.; Quinn, D.J.; Roth, R.L. (Argonne Natl Lab, Ill). pp 1735-1744 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

The status and results of recent Upper Plenum Injection (UPI) and related experiments are described. The experiments include UPI mockup tests performed with reactor materials, UPI mockup tests performed with simulant materials to examine separate effects, and UPI-type tests performed with sodium in. While these tests are still in an ongoing stage and thereby not yet conclusive, none of the tests performed pressurizations capable of recompacting the core in the LMFBR system. 5 refs.

18662 Cladding and fuel motion of irradiated stainless steel-clad mixed-oxide fuels in response to simulated thermal transients. Bandyopadhyay, G.; Buzzell, J.A. (Argonne Natl Lab, Ill). pp 1745-1755 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

Direct-electrical-heating (DEH) experiments have been performed on irradiated stainless steel-clad mixed-oxide fuels to study the cladding and fuel motion during simulated loss-of-flow type thermal transients. A modified DEH apparatus was used to perform the experiments, in which cladding was melted before the transient power ramp began. The nature, timing, and extent of fuel motion prior to and at the time of failure are determined by the fission-gas inventory in the fuel and the detailed nature of the transients. 17 refs.

18663 Fuel motion in the CAMEL top-simulation LMFBR safety tests. Spencer, B.W.; Henry, R.E.; Armstrong, D.R.; Bova, L.; Goldfuss, G.T.; Raridon, D. (Argonne Natl Lab, Ill). pp 1756-1765 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

Post-failure fuel motion in coolant channels has been examined in a series of CAMEL-loop experiments under conditions of the postulated, unterminated transient overpower accident in an LMFBR. The observed fuel motion behavior, together with test data depicting channel pressurization and sodium flowrate behavior, have given evidence that bundle coherency as well as the occurrence of local, small-scale fuel-coolant interactions have significant bearing on fuel sweepout. 5 refs.

18664 Summary and evaluation of reactor-material fuel freezing tests. Spencer, B.W.; Henry, R.E.; Fauske, H.K.; Goldfuss, G.T.; Roth, R.L. (Argonne Natl Lab, Ill). pp 1766-1775 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

A series of 13 fuel freezing tests has been completed, examining the pressure-driven penetration of molten core materials injected axially through simulated above- and below-core fuel pin regions of the LMFBR subassembly. The tests have shown that considerable molten fuel/metal mixture can be removed from the core, but that it is likely to freeze and plug in the pin plenum region. Molten steel appeared to play an important role in channel plugging. 5 refs.

18665 Blowdown of boiling pools with internal heat generation. Henry, R.E.; Smith, J.L.; Weber, J.T. (Argonne Natl Lab, Ill). pp 1776-1785 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

Depressurization experiments were conducted with water in a transparent lucite vessel with various initial void fractions. Experiments were also carried out with bulk nucleation sites "seeded" in the liquid phase and with no such "seeding". The experiments show that with bulk nucleation sites the mixture maintains a homogeneous character during blowdown, essentially the entire liquid mass is vented during the depressurization, and a homogeneous model gives an accurate representation of the transient. 5 refs.

18666 Experimental verification of subassembly duct integrity under high heat loads. Smith, J.L.; Helenberg, H.W.; Wilson, R.E.; Kilsdonk, D.J.; Baldwin, R.D.; Pedersen, D.R. (Argonne Natl Lab, Ill). pp 1820-1829 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

The present experimental program provides a full-scale out-of-pile simulation of a single subassembly meltdown condition with the resultant application of a uniform heat flux to one flat of the adjacent subassembly ducts. Two tests were run one with an fully annealed duct and the second with 20% cold worked duct. The results are discussed. 4 refs.

18667 Analysis of the heat and mass transfer processes of a UO_2 bubble in sodium. Tobias, M.L. (Oak Ridge Natl Lab, Tenn). pp 1830-1837 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

The anticipated behavior of uranium oxide vapor bubbles produced by the capacitor discharge vaporization (CDV) method in the Fuel Aerosol Simulant Test (FAST) Facility is discussed on the basis of relatively simple physical models. Results of calculations for the rate of bubble rise and for heat and mass transfer rates are presented. No important effects were noted in connection with bubble depth, initial quantity of UO/sub 2/, or initial superheat. 9 refs.

18668 Analysis of postdisassembly expansion experiments. Suo-Anttila, A.J. (Los Alamos Sci Lab, NM). pp 1848-1857 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

The SIMMER-II computer code has been used to analyze the SRI International flashing-water experiments. Good agreement was reached between the computer predictions and the experimental measurements. The computed results were found to be very sensitive to the flow-regime models. Nonequilibrium effects dominate the energetics of the calculation rather than the non-uniform effects that have been predicted for full-scale LMFBRs. 3 refs.

18669 **PLOF accident preview: results of a test employing 34 simulated GCFR fuel rods.** Hanson, D.L.; Giger, A.J. (Los Alamos Sci Lab, NM). pp 1868-1877 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

A Los Alamos Scientific Laboratory program is aimed at simulating a GCFR Protected Loss of Flow (PLOF) accident in an out-of-pile experiment employing 438 simulated fuel rods. The design concepts are being tested in a 34-rod ensemble. The results of the first destructive test of one of these subgroups of rods provide a preview of the processes attendant to a PLOF in the GCFR core. 1 ref.

18670 **Safety approach to the selection of design criteria for the CRBRP reactor refueling system.** Meisl, C.J.; Berg, G.E.; Sharkey, N.F. (Rockwell Int, Canoga Park, Calif). pp 1890-1901 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

This paper describes the overall approach and underlying logic that were used while developing safety design criteria for the reactor refueling system of the Clinch River Breeder Reactor Plant (CRBRP). The complete selection process used to establish the criteria is presented, from the definition of safety functions to the finalization of safety design criteria in the appropriate documents. The process steps are illustrated by examples. 6 refs.

18671 **Design optimization of a prototype large breeder reactor safety system.** Rasmuson, D.M.; Burdick, G.R.; Wilson, J.R. (Edgerton, Germeshausen and Grier Inc, Idaho Falls, Idaho). pp 1942-1951 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

A procedure is presented that can be used in the conceptualization, evaluation of, and selection among several conceptual liquid metal fast breeder reactor designs. The method can be effectively used to: (a) allocate optimal component redundancy, (b) evaluate design trade-offs, and (c) help in design finalization. The procedure is applied to three diverse design options for a shutdown heat removal system. The selected configuration is analyzed for potential common cause failures. 4 refs.

18672 **Assessment of design options for HCDA energetics accommodation.** Bell, C.R.; Blewett, P.J. (Los Alamos Sci Lab, NM). pp 1952-1961 of International meeting on fast reactor safety technology. LaGrange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

Several design features for liquid metal fast breeder reactors are assessed for their capacity to extend containment tolerance during hypothetical core-disruptive accidents. Design features are assessed for forces to the reactor head, down forces to the lower vessel closure, pressures on the vessel wall, changes in fuel-coolant interaction (FCI) potential, post-impact pressures, and core debris dispersal. 4 refs.

18673 **LEVITATE--a mechanistic model for the analysis of fuel and cladding dynamics under LOF conditions for SAS4A.** Tentner, A.M.; Wider, H.U. (Argonne Natl Lab, Ill). pp 1998-2007 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

The new LEVITATE model, which will be part of SAS4A, has been designed to treat both the high power and the near-nominal power conditions in voided assemblies of an LMFBR. LEVITATE also models several relevant phenomena, not considered in earlier models. The most important of them are several pin disruption modes, continuous fuel-steel flow regimes, fuel-steel crust and plug formation and a tight coupling with the sodium dynamics. As a calculational example a LEVITATE post-test analysis of the L-7 experiment is presented. 11 refs.

18674 **Examination of subassembly scale fuel motion using the SIMMER-II code.** Alcouffe, R.E.; Henninger, R.J. (Los Alamos Sci Lab, NM). pp 2008-2019 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

Subassembly scale fuel motion during the early fuel dispersal and extended fuel motion phases of an LMFBR loss of flow accident are examined with the SIMMER-II code. Results are compared and contrasted with previous analyses and selected experiments. 13 refs.

18675 **Comparison of fission-gas effects in a transient overpower test (HUT 5-7A) to FRAS3 code predictions.** Gruber, E.E.; Randklev, E.H. (Argonne Natl Lab, Ill). pp 2050-2059 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

Fission gas has an important bearing on fuel dynamics during reactor transients. In this paper, fission-gas bubble sizes and densities, both within grains and on grain boundaries, are characterized as functions of radial location across the axial midplane of the HUT 5-7A (PNL 9-25) TOP (50 /cent/sub s/) TREAT tested fuel pin. The FRAS3 code, being developed to model fission-gas effects in reactor transients, is applied to analyze the results of this experiment. Comparisons between measured data and calculated results for the HUT 5-7A test are presented to illustrate the observed phenomena and to demonstrate the validity of the modeling approach. 13 refs.

18676 **Dual change-of-phase in forced flow on a finite wall, with application to SLSF safety analysis.** El-Genk, M.S.; Moore, R.L. (Edgerton, Germeshausen and Grier Inc, Idaho Falls, Idaho). pp 2071-2080 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

An assessment of molten fuel containment capability for the Sodium Loop Safety Facility (SLSF) in-pile experiments following a postulated LOFA is presented, considering the conditions of molten fuel flow, simultaneous melting in the outer duct wall, and convective cooling at the outer surface of the wall due to sodium coolant bypass flow. 7 refs.

18677 **Study of heat transfer from a flowing liquid to a melting wall.** Eisenhawer, S.W.; Lee, L.O.; Corradini, M.L.; Ostensen, R.W.; Gonzales, F. (Sandia Lab, Albuquerque, NM). pp 2081-2092 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

In order to investigate fuel freezing phenomenology in the transition phase of an LMFBR accident, a separate effects experiment was conducted. These tests investigated the melting behavior of an ice pipe due to warm refrigerant (R-11) flow. A thin film heat transfer model shows good agreement with the experimental results. When this thin film model is applied to the transient freezing and melting process in a fuel-steel LMFBR system, the predicted fuel penetration distance is in very good agreement with the experimental results of Spencer and Henry. 27 refs.

18678 **Sodium concrete reactions.** Colburn, R.P.; Muhlestein, L.D.; Hassberger, J.A.; Mahncke, A.J. (Hanford Eng Dev Lab, Richland, Wash). pp 2093l-2102 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

This paper summarizes the data from an extensive series of sodium/concrete reaction tests and proposes mechanisms by which the reactions proceed. The results indicate water transport and the resulting sodium/water reaction dominate both the chemical energy release and H/sub 2/ generation. This paper proposes a mechanism which explains the limited penetration of concrete observed in most of these tests. 5 refs.

18679 **Breeder reactor faulted cavity liner feature tests.** Mahncke, A.J.; Muhlestein, L.D.; Wierman, R.W.; Colburn, R.P. (Hanford Eng Dev Lab, Richland, Wash). pp 2103-2112 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

This paper describes an experimental study of faulted liner feature tests conducted at HEDL in support of breeder reactor safety analysis. The tests were conducted on two different reactor cavity floor configurations. The results show that the liner section, which is made up of various insulating materials, was effective in inhibiting the sodium from migrating into the structural concrete. 2 refs.

18680 **Model and computer code for energy and mass transport in decomposing concrete and related materials.** Knight, R.L.; Beck, J.V. (Sandia Lab, Albuquerque, NM). pp 2113-2121 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

In a hypothetical core disruptive accident, it is postulated that liquid metal coolants and core materials come in contact with the retaining concrete structure. A mathematical model and an associated computer program have been developed to describe the transient heat and mass transfer in the concrete. Predictions of the model are compared with experimental results obtained at Sandia Laboratories and at Hanford Engineering Development Laboratory. 5 refs.

18681 **Sodium interaction with concrete and firebrick.** Acton, R.U.; Sallach, R.A.; Smaardyk, J.E.; Kent, L.A. (Sandia Lab, Albuquerque, NM). pp 2122-2133 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

A knowledge of the reactions of liquid sodium with construction materials of fast nuclear reactors is important in safety analyses. Twelve large-scale experiments (up to 250 Kg Na into 4000 Kg crucibles) have been performed. Energetic exothermic reactions were produced in eight of these experiments. A chemical model is presented to describe these reactions. 3 refs.

18682 **Studies of the role of molten materials in interactions with UO_2 and graphite.** Fink, J.K.; Heiberger, J.J.; Leibowitz, L. (Argonne Natl Lab, Ill). pp 2134-2139 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

In a study of the interaction of graphite, UO/sub 2/, and stainless steel, the effects of the steel components have been investigated by electron microprobe scans, X-ray diffraction, and reaction-rate measurements. Experiments to study the role of the reaction product, FeUC/sub 2/, in the interaction suggested that FeUC/sub 2/ promotes the interaction by acting as a carrier to bring graphite to the reaction site. Additional experiments using pyrolytic graphite show that while the reaction rate is decreased at 2400 K, at higher temperatures the rate is similar to that using other grades of graphite. 4 refs.

18683 **Reliability assessment of main loop residual heat removal options in the GCFR.** Taniguchi, T.; Torri, A. (Gen At Co, San Diego, Calif). pp 2192-2201 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

16 improved main loop residual heat removal options were identified and analyzed for their potential to improve heat removal train reliability. Ten shutdowns and three reactor trips per year with a plant availability data of 80% formed the basis of the analysis. The results of quantitative reliability analyses using the evaluated reliability data bank for gas-cooled reactors showed that several of the systems analyzed had the potential for substantial improvements in the main cooling system reliability. On the basis of this work, a new interim design of the main loop residual heat removal system has been adopted. 2 refs.

18684 **Reliability comparison of forced and natural convection residual heat removal in the GCFR.** Raabe, P.; Taniguchi, T.; Torri, A. (Gen At Co, San Diego, Calif). pp 2202-2212 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

A quantitative assessment of the Residual Heat Removal reliability achievable with and without Natural convection is discussed. The reliability gains due to natural convection are limited by the demand frequency for PCRV depressurization and by the equipment which has to change state in order to establish natural convection. The coolant circulation diversity accomplished with natural convection is a major advantage. 3 refs.

18685 **Role of steam generators in nuclear power plant safety and availability.** Wood, A.P.; Crellin, G.L. (GE, Sunnyvale, Calif). pp 2213-2222 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

A method is presented to analyze steam generator reliability and availability through the use of specialized Markovian techniques. The results are presented in a manner which will be useful in steam generator safety and economic feasibility studies. 5 refs.

18686 **Progress in fuel-motion-diagnostics instrumentation evaluation at Parka.** Evans, A.E. Jr.; Orndoff, J.D. (Los Alamos Sci Lab, NM). pp 2225-2234 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

Hodoscope neutron and gamma-ray imaging of bundles containing from 1 to 127 pins have been studied. Ability to image a single missing pin from assemblies of up to 127 pins has been established. The image of a single-pin void in a test assembly was found to vary with the depth of the void in the assembly, for both 37-pin and 127-pin bundles. The degree to which a thick steel test casing will impede image quality has been studied. A 21-mm-thick casing was found to reduce the sensitivity of fast-neutron hodoscope images to fuel defects by 30% and of gamma-ray images by 50%. 9 refs.

18687 **PINEX-2: pinhole-TV imaging of fuel ejection from an internally vented capsule.** Berzins, G.J.; Lumpkin, A.H. (Los Alamos Sci Lab, NM). pp 2235-2242 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

The LASL pinhole-intensified TV system was used at the TREAT reactor to image an internally vented, fuel-ejection capsule designed and built by HEDL. Several improvements in the imaging system over PINEX-1 were incorporated. A sequence of 16-ms TV frames shows axial expansion, expulsion of fuel from the pin, and retention of clad integrity during the time of coverage. 1 ref.

18688 Developments in the LASL fuel pin imaging system: PINEX-3A. Lumpkin, A.H.; Berzins, G.J.; Cosimi, R.A.; O'Hare, T.E.; Davidson, J.R. (Los Alamos Sci Lab, NM). pp 2243-2251 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

The LASL Fuel Pin Imaging System was evaluated using a series of 10 TREAT transients, each of /similar/240-MW peak power. The impact of changes in instrumentation, imaging apertures, and fluors that produced the improved sensitivity are reported. Results of a time-integrated imaging technique are also presented.

18689 Noise reduction of fuel pin images with a diffraction filter. Miller, E.L.; Han, K.S. (Los Alamos Sci Lab, NM). pp 2252-2260 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

The quality of "noisy" images can be improved by summing several simular but statistically independent images that have been obtained either using a series of fluors in a stack intercepting the radiation from a single pinhole or by using multiple pinhole arrays or other coded apertures. An optical method of performing this addition is being explored for fuel pin imaging, and is presented here along with experimental results. In addition, the extension of this method to the simultaneous display of depth planes of a three-dimensional source is discussed. 2 refs.

18690 Potential of high speed x-ray cinematography as a fuel motion diagnostic for safety test facilities. Stalker, K.T.; Choate, L.M.; Posey, L.D. (Sandia Lab, Albuquerque, NM). pp 2270-2278 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

Experiments have been performed which indicate the feasibility of using X-ray cinematography as a diagnostic tool for monitoring fuel motion in large pin bundle advanced reactor safety tests. This capability was demonstrated by imaging motion in a 37-pin bundle of simulated fuel elements at a data rate of 400 pictures per second using an active detector system coupled with a 10 MeV accelerator. 5 refs.

18691 Current and advanced methods for determining quantitative fuel dispersion using hodoscope data. De Volpi, A.; Bertoncini, P.; Fink, C.; Klickman, A.; May, R.; Person, L.W.; Rhodes, E.; Stanford, G.S. (Argonne Natl Lab, Ill). pp 2279-2288 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

Surveillance of fuel-motion in TREAT experiments using the fast neutron hodoscope has advanced from an initial role of providing time-location-velocity data to that of offering quantitative mass displacement results. To meet the experiment requirements of the TREAT Upgrade and advanced safety test facilities, improvements are being studied by experiment and calculation. With expected improvements in detection and data analysis, results indicate that most performance specifications can be met. 7 refs.

18692 SPR-III 7-pin in-core fuel motion detection feasibility experiments. Wright, S.A.; McDaniel, P.J.; Powell, J.E.; Scott, W.H. Jr. (Sandia Lab, Albuquerque, NM). pp 2289-2301 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

Experiments were performed in the Sandia Pulsed Reactor to demonstrate the feasibility of in-core fuel motion detection. In these experiments fuel motion was mechanically induced and detected by 22 gamma sensitive detectors. A theoretical model using nonlinear perturbation theory was developed to determine the sensitivity of the detectors to fuel motion. Depending on the fuel-mass resolution required, it appears that the technique of in-core fuel motion detection is feasible for many reactor safety experiments. 12 refs.

18693 Theory and application of the coded aperture fuel motion detection system. Kelly, J.G.; Stalker, K.T.; McArthur, D.A.; Chu, K.W.; Powell, J.E. (Sandia Lab, Albuquerque, NM). pp 2302-2310 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

A fuel motion detection system based on coded aperture imaging has been developed for the Annular Core Research Reactor. This paper contains a description of the apparatus and a brief summary of the proof tests in which fuel motion has been observed. Because of the encouraging progress in the adaptation of coded aperture technology to the fuel motion investigations, additional theoretical and experimental studies have been carried out on aperture design, reconstruction methods, filtering and neutron imaging. 9 refs.

18694 THORS--a high-temperature sodium test facility rated at 2.0 MW. Gnadt, P.A.; Anderson, A.H.; Clapp, N.E.; Montgomery, B.H.; Collins, C.W.; Stulting, R.D. (Oak Ridge Natl Lab, Tenn). pp 2311-2321 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

The Thermal-Hydraulic Out-of-Reactor Safety (THORS) facility at Oak Ridge National Laboratory (ORNL) is a high-temperature sodium test facility operated for the United States Breeder Reactor Safety Program. The facility is primarily used for testing large simulated Liquid-Metal Fast Breeder Reactor fuel subassemblies. A description of the test facility is presented, along with a brief summary of the 8-year operating history of this safety-related test facility. 26 refs.

18695 Comparison of large scale fast reactor safety test requirements with the Sandia HFFPR design. Odom, J.P.; Philbin, J.S.; Nelson, W.E. (Sandia Lab, Albuquerque, NM). pp 2331-2340 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

This paper represents an effort to establish a preliminary test matrix for examining and designing large-scale tests and safety test facilities in parallel with the conduct of small-scale experiments. It is concluded that the multipurpose HFFPR (High Fluence Fast Pulse Reactor) could be utilized in addressing many of the remaining fast reactor safety issues requiring large scale experiments. 9 refs.

18696 Fast reactor test facilities in the US safety program. Avery, R.; Dickerman, C.E.; Lennox, D.H.; Rose, D. (Argonne Natl Lab, Ill). pp 2351-2363 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

The needs for safety information derivable from in-pile programs are reviewed, and the correlation made with existing and planned capability. In view of the current status of the U.S. breeder program, emphasis is given in the review to the impact of different fast breeder options on the required program and facilities. It is concluded that facility needs are somewhat independent of specific fast breeder concept, even though the relative emphasis on the various safety issues will differ. 8 refs.

18697 Integral postdisassembly energetics test: a preliminary investigation. Barts, E.W.; Asprey, M.W.; Burns, R.D. III; Chapyak, E.J.; Dunwoody, W.E.; Helmick, H.H. (Los Alamos Sci Lab, NM). pp 2364-2374 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

Scaled, real-material integral tests could demonstrate mitigating mechanisms in postdisassembly energetic behavior during a hypothetical accident in a liquid metal fast breeder reactor. Studies were performed to determine important system parameters including the test geometry necessary to maintain prototypicality. Neutronic behavior of the core and radial blanket configuration was studied to assure a controlled energetic burst. An engineering design study was performed to determine test feasibility. 13 refs.

18698 EBR-II breached fuel test facility. Lehto, W.K.; Koenig, J.F.; Seim, O.S.; Olp, R.H.; Strain, R.V.; Colburn, R.P. (Argonne Natl Lab, Idaho Falls, Idaho). pp 2374-2382 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

The Breached Fuel Test Facility (BFTF) is a multipurpose experimental facility, designed to provide the capability to conduct and monitor safety and fuel behavior experiments under more severe conditions than previously allowed in EBR-II. The BFTF has the capability to measure flow, temperature, particle size distribution and deposition, and delayed neutron levels for breach site characterization. This paper describes the design, the instrumentation, the operational safety concerns and the initial experiments. 3 refs.

18699 Design and proposed utilization of the Sandia Annular Core Research Reactor (ACRR). Walker, J.V.; Reuscher, J.A.; Pickard, P.S.; Schmidt, T.R.; Powell, J.E.; Karnes, C.H.; Davis, J.H.; Coats, R.L.; Camp, W.J.; Sullivan, W.H.; Posey, L.D.; Boldt, K.R.; Sasmor, D.J.; Marshall, A.C.; Morris, F.M. (Sandia Lab, Albuquerque, NM). pp 2383-2393 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

The Annular Core Research Reactor (ACRR) is the result of a four year program to improve the performance of the Annular Core Pulse Reactor (ACPR) for advanced reactor safety programs and weapon radiation effects experiments. The U-ZrH fueled core of the ACPR was replaced with a core of uniquely designed BeO-UO/sub 2/ fuel elements. This paper described the design, performance characteristics, and reactor safety experiment capabilities of the ACRR. 6 refs.

18700 Gas reactor in-pile safety test project (GRIST-2). Kelley, A.P. Jr.; Arbtin, E.; St. Pierre, R. (Helium Breeder Assoc, San Diego, Calif). pp 2394-2403 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

The GRIST-2 objective is to provide an in-pile test loop in preparation for performing tests to verify analytical models and codes of gas-cooled fast breeder reactor fuels by experimental exploration of the consequences of loss of flow and transient overpower conditions with failure to scram. The project organization, experiment program, facility, helium system design, and schedule which have been selected to meet the objectives are described.

18701 FFTF regulatory review for operating authorization. Schade, A.R.; Simpson, D.E. (Hanford Eng Dev Lab, Richland, Wash). pp 2425-2430 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

The regulatory review for the operating authorization of FFTF is reported. The history of the construction review and post Preliminary Safety Analysis Report open issue review are discussed. The review processes at the operating stage are explained. Identification of major review issues with NRC and their resolutions are discussed. 13 refs.

18702 Operational-safety-testing experience at EBR-II. Sackett, J.I.; Dean, E.M.; Fryer, R.M.; Golden, G.H.; Lambert, J.D.B.; Lehto, W.K.; Singer, R.M. (Argonne Natl Lab, Idaho Falls, Idaho). pp 2450-2458 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

Operation of EBR-II has required that issues of safety and reliability be continually addressed. Major issues are (1) operability of fuel elements with breached cladding (local fault prevention), (2) assurance of adequate convective cooling upon loss of pumping power (decay heat removal), and (3) demonstration of benign response of fuel-elements and subassemblies to protected overpower transients (shutdown system margin and reliability). Test programs to address these issues at EBR-II are described. 8 refs.

18703 Decade of fuels endurance testing at EBR-II. Lambert, L.D.B.; Kirn, F.S.; Monson, L.R.; Strain, R.V.; So, B.Y.C. (Argonne Natl Lab, Ill). pp 2459-2469 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

Over 7000 experimental fuel elements have now been irradiated in EBR-II in direct contact with primary sodium. On sixty-eight occasions breach of cladding has caused release of radioactive fission products to the primary system, but with minimal radiological hazard to operators. Most failures occurred in endurance tests of the EBR-II metal driver fuel and of the FTR mixed-oxide driver fuel. This experience has emphasized that failure of LMFBR fuel elements is a benign process under normal reactor operating conditions. 14 refs.

18704 Delayed neutron detection in the Sodium Loop Safety Facility. Braid, T.H.; Porges, K.G.; Tebo, F.J.; Wilson, R.E.; Heiberger, W.F.; Holzworth, R.E.; Shire, P.R.; Turner, R.D. (Argonne Natl Lab, USA). pp 2623-2629 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

Two systems are being added to the test loop to detect delayed neutrons following fuel failure in SLSF tests. In the first, neutrons from a 13-liter volume of sodium inside the loop are observed by detectors in a sealed box placed inside the reactor vessel. In the second, a stream of sodium from the loop is delivered to an external /one-half/-liter sample volume. A sensitivity range of /similar/ 10/sup 8/ will be accommodated without saturation by arrays of detectors of different efficiencies. 9 refs.

18705 Levels of safety satisfactory for commercialization of the breeder. Ferguson, R.L. (US DOE, Washington, DC). pp 2704-2709 of International meeting on fast reactor safety technology. La Grange Park, IL; American Nuclear Society (1979).

From International meeting on fast reactor safety technology; Seattle, WA, USA (19 Aug 1979).

A brief discussion is presented of the Department of Energy's LMFBR safety program and the safety levels which DOE believes would be satisfactory for the commercialization of the breeder are indicated. Some observations are offered on the Three Mile Island accident and some of its implications are discussed for the LMFBR program.

25 ENERGY STORAGE

2501 Magnetic

REFER ALSO TO CITATION(S) 19550

18706 (LA—8777-PR) Superconducting magnetic energy storage (SMES) program. Progress report, January 1-December 31, 1980. Rogers, J.D. (comp.). (Los Alamos National Lab.,. NM (USA)). Mar 1981. Contract W-7405-ENG-36. 38p. NTIS, PC A03/MF A01.

Work is reported on the development of two superconducting magnetic energy storage (SMES) units. One is a 30-MJ unit for use by the Bonneville Power Administration (BPA) to stabilize power oscillations on their Pacific AC Intertie, and the second is a 1- to 10-GWh unit for use as a diurnal load leveling device. Emphasis has been on the stabilizing system. The manufacturing phase of the 30-MJ superconducting coil was initiated and the coil fabrication has advanced rapidly. The two converter power transformers were manufactured, successfully factory tested, and shipped. One transformer reached the Tacoma Substation in good condition; the other was dropped enroute and has been returned to the factory for rebuilding. Insulation of the 30-MJ coil has been examined for high voltage effects apt to be caused by transients such as inductive voltage spikes from the protective dump circuit. The stabilizing system converter and protective energy dump system were completed, factory tested, and delivered.

2503 Pumped Hydro

REFER ALSO TO CITATION(S) 18160

2505 Flywheels

REFER ALSO TO CITATION(S) 18933

18707 (Y/DX—227) Oak Ridge Flywheel Evaluation Laboratory test report on the Garrett AiResearch Flywheel. Steele, R.S.; Babelay, E.F. (Oak Ridge Y-12 Plant, TN (USA)). Feb 1981. Contract W-7405-ENG-26. 93p. NTIS, PC A05/MF A01.

The high-energy-density Flywheel G-1, bulit by Garrett AiResearch Manufacturing Company, was tested with only minor deviations from the test plan. Dimensional measurements were made within two weeks after receiving the part and were repeated after Run 9. The graphite-epoxy-composite spokes began to splinter in four tip locations after the sixth balance run to 200 Hz (12,000 rpm). Testing was continued until a catastrophic failure was achieved. The spoke splintering did not appear to be a factor in the ultimate capability. Maximum stored energy was 1.16 kWh (4.17 MJ) at 74.6 Wh/kg (269 kJ/kg) at 463 rps (27,780 rpm). Ultimate speed was limited by a dynamic instability at 463 rps. Actual failure occurred in a braking mode at 390 rps. Other observations of dynamic behavior included the mass eccentricity shifting repeatably with speed at a rate of 0.051 mm in 170 Hz; this action was attributed to nonuniform flexing of the rim. A permanent balance shift of approximately 0.051 mm occurred, possibly indicating a slippage of the rim relative to the hub. Radiography shows that the rims realigned themselves. Finally, the channels in the hub proved very difficult to outgas and required extremely long pump-down times to achieve the specified 10^{-3}-torr chamber pressure.

2506 Thermal

REFER ALSO TO CITATION(S) 18372, 18488, 18490, 18493, 18494, 18495, 18496, 18497, 18933, 19622

18708 (CONF-790748—) Peak-load pricing and thermal energy storage. (Department of Energy, Washington, DC (USA). Div. of Energy Storage Systems; Argonne National Lab., IL (USA); Illinois Univ., Chicago (USA). Energy Resources Center). 1979. 169p. NTIS, PC A08/MF A01.

From Conference on peak load pricing and thermal energy storage; Chicago, IL, USA (15 Jul 1979).

Twenty papers were presented at the meeting. A separate abstract was prepared for each of 19 papers. One paper was processed previously for the Energy Data Base (EDB). Fifteen of the papers were processed for inclusion in Energy Abstracts for Policy Analysis (EAPA). (LCL)

18709 (CONF-790748—, pp 8-25) British experience with thermal energy storage. Platts, J.R. (Electricity Council, London, England). 1979. NTIS, PC A08/MF A01.

From Conference on peak load pricing and thermal energy storage; Chicago, IL, USA (15 Jul 1979).

Experience in England and Wales in promoting electric power load management by time-of-day pricing and by the introduction of thermal energy storage devices for the space heating of buildings is discussed in detail. The design and operation of several thermal energy storage heating systems are described. Data are presented on the success of the two load management schemes. Over a 20-y period, total system power demand curves show a 24 h variation of 60 to 100% now versus 33 to 100% 20 years ago. (LCL)

18710 (CONF-790748—, pp 26-29) Introduction of peak-load pricing in Europe. McKay, D.J. 1979. NTIS, PC A08/MF A01.

From Conference on peak load pricing and thermal energy storage; Chicago, IL, USA (15 Jul 1979).

A brief historical review is presented of experience in France and Great Britain with peak-load pricing. Some form of peak-load pricing has been practiced in Britian and France for the last several decades. While the greatest gains in terms of cost saving have taken place at the industrial level, both countries have found it profitable to extend some form of time-of-day tariff to the residential consumer. The major loads which have been modulated in response to these price signals are those associated with storage heating. The storage devices are generally automatically switched on when the cheaper electricity is available. A recurrent problem has occurred in Britain when large numbers of thermostatically controlled loads are initially switched on. Staggered time periods are used in the newer tariffs to alleviate this problem and to avoid artificial system peaks. The French do not seem to be bothered by this problem at present. (LCL)

18711 (CONF-790748—, pp 30-40) Electric space heating in West Germany. Borstelmann, P. (Rheinisch-Westfaelisches Elektrizitaetswerk A.G., Osnabruck, Germany). 1979. NTIS, PC A08/MF A01.

From Conference on peak load pricing and thermal energy storage; Chicago, IL, USA (15 Jul 1979).

The promotion of heat-storing space heating equipment, primarly for rooms in residential buildings in West Germany is discussed. The success of this program, in terms of customer demand and acceptance and in terms of shifting power demand to nighttime periods, and future plans for power demand management and energy conservation in space heating is discussed. The thermal energy storage systems were so successful that a night peak demand was being created. This was relieved by offering lower charges for electricity in the midafternoon as well as at night. It was concluded that electrical storage heating in West Germany will enjoy a good market in the future, the volume of which will depend on the construction of new power plants. The world-wide need to save primary energy, to make optimum use of existing power generating capacity and to reduce the burden on the environment will increasingly favor as well, use of the dual-source heat pump system. Finally, electric direct heating will need to be promoted in the long run. This requires excellent thermal insulation of the buildings as in specific terms that is the most expensive electrical method of space heating because the consumer has to pay in full for all capital expenditure from the power plant to the service connection and for the cost of the energy supplied. Within a few decades it will no longer be possible to use fossil fuels for heating. Electric energy, and perhaps to some extent solar energy, will then be the only possibilities for heating buildings. (LCL)

18712 (CONF-790748—, pp 54-58) Concept statement for distributed thermal storage. Swisher, J.H. 1979. NTIS, PC A08/MF A01.

From Conference on peak load pricing and thermal energy storage; Chicago, IL, USA (15 Jul 1979).

The US DOE program for evaluating the market prospects for within-building thermal energy storage (TES) equipment to be used in conjunction with electric space heating, water heating and air conditioning is discussed. Results of recent studies showed that TES systems were cost effective relative to conventional space conditioning and hot water equipment, but the benefit/cost ratios depend critically on the shape of the utility's seasonal and winter-peaking service areas. Storage was found to offer significant savings relative to conventional heat pump and direct resistance heating systems. Benefit/cost ratios for electric storage heating in these locations ranged from 3:1 to 6:1. Storage air conditioning is an effective load-leveling technology in summer-peaking service areas. However, the benefit/cost ratio, typically 1.6:1, is much lower than for storage heating. Storage water heating is cost effective in both summer- and winter-peaking areas. Examples of projected costs and paybacks for TES and representative competing technologies are shown. These projections are estimates that will be refined during the next phase of the commericialization study.

18713 (CONF-790748—, pp 59-64) **Overview of thermal energy storage for peak load pricing applications.** Eissenberg, D.M. (Oak Ridge National Lab., TN). 1979. NTIS, PC A08/MF A01.

From Conference on peak load pricing and thermal energy storage; Chicago, IL, USA (15 Jul 1979).

The application of customer-owned thermal energy storage (CO/TES) to utility load management is described. Issues of concern to the potential customer faced with the decision of whether or how to utilize thermal energy storage devices in conjunction with heating and/or air-conditioning systems are addressed. Four subject areas are discussed, i.e., incentives, application options, system components subsystems, and the Department of Energy-Division of Energy Storage System's (DOE/STOR) program of technology development for thermal energy storage.

18714 (CONF-790748—, pp 65-74) **Current activities in cool storage.** Krubsack, R.M. 1979. NTIS, PC A08/MF A01.

From Conference on peak load pricing and thermal energy storage; Chicago, IL, USA (15 Jul 1979).

Demonstrations of the use of ice for cool storage in order to shift building air conditioning peak loads are described. The design, operation, and economics of the ice-making and space cooling equipment developed for cooling residential and industrial buildings are described, and the results in terms of cost, comfort, and off-peak power consumption are presented. The demonstration has shown that stored cooling is a viable alternative for reducing the system peak caused by air conditioning. The economics at this point are questionable since not one mass produces the equipment and a time-of-use rate has not been approved yet. The demonstration also indicates an improvement in comfort with two-stage cooling on a storage system as compared to conventional on-off air conditioning. (LCL)

18715 (CONF-790748—, pp 75-85) **Storage assisted air conditioning using a new low-cost phase change material packaging concept.** Barnett, A.M.; Frysinger, G.R. (Univ. of Delaware, Newark). 1979. NTIS, PC A08/MF A01.

From Conference on peak load pricing and thermal energy storage; Chicago, IL, USA (15 Jul 1979).

The realization of the promise of storage-assisted air conditioning for saving oil and money is dependent upon the successful development of a low-cost storage subsystem and the adoption of time-of-day electricity rates. This paper describes the development of a low-cost storage component for air conditioning systems. Time-of-day rates are currently under consideration or have been adopted in 27 different states and consideration of these rates has been required by federal legislation. The adoption of this low-cost thermal energy storage technology for storage-assisted air conditioning and other storage-assisted heat pump applications has the potential of saving 100 million barrels of oil over the next ten years and 12 million barrels of oil per year by 1985. These savings would accrue from a shift of the summer air conditioning peak electricity load from oil- and gas-fired peak electrical generators to the base load electrical generators fired by coal, nuclear and hydroelectric. This low-cost air conditioning storage concept is based on hydrated salt phase change material, specifically a mixture based on sodium sulfate decahydrate and a new low-cost packing technology which uses a film laminate as the phase change material mixture's package and heat exchanger. The relative economics of various technological options for air conditioning storage are compared. It is demonstrated that this economic analysis leads to the necessity to develop a low cost film package and heat exchanger. An analysis of savings to homeowners based on current and planned off-peak rates is included. Since this is the first product developed utilizing this new low-cost material as a packaging film, it is anticipated that major improvements in both cost and performance specifically related to individual systems will be developed and implemented over the next ten years, with significant improvements coming in the next several years.

18716 (CONF-790748—, pp 86-89) **Heat (ceramic) storage: state-of-the-art.** Lawson, J.E. 1979. NTIS, PC A08/MF A01.

From Conference on peak load pricing and thermal energy storage; Chicago, IL, USA (15 Jul 1979).

The design and operation of a thermal energy storage unit for use with central heating and air conditioning systems in American homes are discussed. The care of this unit is composed of bricks of olivine. Heat is stored during the night using off-peak power. The years of technology development in England and Western Europe were utilized to form the basis of the TES unit in America. Advances on these technologies were made as necessitated by the Americal style of living and market environment. Future designs will refine these technologies. TES units utilizing ceramic cores are available for consumer purchase rendering benefits to the consumer and the utility and a solution to some of our country's energy problems. (LCL)

18717 (CONF-790748—, pp 90-92) **State of the art heat (PCM) storage.** MacCracken, C.D. 1979. NTIS, PC A08/MF A01.

From Conference on peak load pricing and thermal energy storage; Chicago, IL, USA (15 Jul 1979).

Phase change materials (PCMs) designed for various temperature levels are being developed by or for commercial manufacturers for use in storing heat from solar, electric resistance, or electric heat pump condensers. Both air and liquid transfer fluid systems are described with primary focus on the latter using PCMs melting at around 115°F.

18718 (CONF-790748—, pp 93-114) **Overview of the DOE thermal storage program.** Gahimer, J. 1979. NTIS, PC A08/MF A01.

From Conference on peak load pricing and thermal energy storage; Chicago, IL, USA (15 Jul 1979).

The Thermal Energy Storage Program of the US Department of Energy promotes energy savings and fuel substitution by developing and helping to commercialize technologies for storing heat or cold. The sources of energy include industrial and utility waste heat as well as primary sources such as solar, geothermal, nuclear, and fossil fuels. The primary energy sink involved in the storage of cold is winter-chilled air. The program emphasizes applications which possess a potential near-term impact and those which relate to solar and other dispersed energy technologies. These applications include seasonal storage for building heating and cooling; daily storage for active or passive solar and conventional heating and cooling; heat storage for solar thermal electric power generation; and storage for recovery of industrial or utility waste heat. The program has a budget of $8.2 million for FY 1979. Program management for policy, planning, and budget issues is provided by Division of Energy Storage Systems within the Office of Assistant Secretary for Energy Technology. Detailed project management is provided by field organizations, including PNL for seasonal storage, Oak Ridge National Laboratory for low-temperature storage, NASA-Lewis Research Center for high-temperature storage, and Sandia Livermore Laboratory for thermochemical storage and transport. The program includes a diverse range of individual projects, from analytic studies of thermochemical pipelines, through benchscale laboratory investigation of individual phase-change materials, to large-scale field testing of aquifer storage.

18719 (CONF-790748—, pp 116-118) **Introduction.** Ashbury, J.G. (Argonne National Lab., IL). 1979. NTIS, PC A08/MF A01.

From Conference on peak load pricing and thermal energy storage; Chicago, IL, USA (15 Jul 1979).

The results of recent Argonne National Laboratory cost analyses of supplying space heating and cooling services with different types of end-use technologies are presented. Natural gas and fuel oil, as well as electric and electric-assisted heating technologies were evaluated and compared. The SIMSTOR model, which uses synoptic hourly load and weather data, was used to simulate the performance and estimate the marginal costs of supplying electricity to the heating and cooling systems. A gas utility model was used to estimate the cost of supplying gas-fired furnaces. Case studies of a number of utility service areas were preformed. In each service area the individual heating and cooling systems were matched to load requirements of a 1500 ft, well-insulated, detached single family dwelling unit. The heating load amounted to four kilowatt-hours per degree-day. An important finding, is that several electric-based heating technologies are cost-competitive with oil and natural gas heating. Among the electric-based technologies, the lowest cost systems in the winter-peaking service area are the storage resistance furnace combined with a conventional air conditioner and the heat pump augmented either by storage or by an oil furnace. In the summer-peaking service area, the heat pump with diurnal cool storage is the lowest cost system. Although the foregoing results are strictly applicable only to the two service areas under study here, analyses of other service areas indicate that load-managed electric heating is cost-competitive with oil and natural gas heating over most of the United States. For a nation wanting to reduce its dependence on foreign oil and attempting to conserve its domestic oil and gas reserves, the implications are obvious.

18720 (CONF-790748—, pp 119-135) **Utility system planning and thermal energy storage: the AEP field test program.** Miller, D.M. 1979. NTIS, PC A08/MF A01.

From Conference on peak load pricing and thermal energy storage; Chicago, IL, USA (15 Jul 1979).

In order to demonstrate the load-leveling potential of residential thermal energy storage (TES) equipment, 70 storage furnaces and 70 storage water heaters were installed in homes with electric heating systems. The equipment used, the rate charges developed, and the data acquired for evaluating the effects of TES on both the customer and the utility are described. The results showed that homes with TES equipment created no load on the power system during the on-peak period, that this effective shifting of power demand to off-peak periods means a savings to the utility of 2 KW capacity for each electrically heated home added to the power system load, that capacity planning and rate tarriffs are beneficially affected, and that residential TES equipment will be promoted by the utility that sponsored this demonstration. (LCL)

18721 (CONF-790748—, pp 136-142) **Peak-load pricing and thermal energy storage.** Reeves, G. 1979. NTIS, PC A08/MF A01.

From Conference on peak load pricing and thermal energy storage; Chicago, IL, USA (15 Jul 1979).

The experience of General Public Utilities Co., in New Jersey and Pennsylvania in peak load pricing and thermal energy storage as load management means is described. Over several years peak loads have been successfully shifted to off-peak hours by the use of more efficient equipment in commercial and industrial buildings and by the financial incentives of lower off-peak rates. Future load management will entail the use of thermal energy storage equipment which has already been proven effective for reducing space and water heating peak-period demands and only remains to be implemented on a large scale. (LCL)

18722 (CONF-790748—, pp 154-158) **Peak load pricing and thermal energy storage: the experience at VEPCO.** Gay, R.S. 1979. NTIS, PC A08/MF A01.

From Conference on peak load pricing and thermal energy storage; Chicago, IL, USA (15 Jul 1979).

The experience of the Virginia Electric and Power Co. in load management by residential use of thermal energy storage equipment and in designing and implementing rate structures is discussed. Several programs for educating customers about the financial advantages of time-of-use pricing and of off-peak heat storage for water heating are described. (LCL)

18723 (CONF-790748—, pp 159-161) **Ratemaking and alternative technologies.** Mahoney, L.T. Jr. 1979. NTIS, PC A08/MF A01.

From Conference on peak load pricing and thermal energy storage; Chicago, IL, USA (15 Jul 1979).

The basic principles of ratemaking are well known. What is needed in the area of alternative technologies, including thermal energy storage (TES), is for all the advocates to stop generalizing about how good their particular technology can be and instead come up with a set of hard, site- and utility-specific facts based on principles of rational economic analysis. How one might go about obtaining this data and perform the necessary analyses is one of the subjects of this paper. Since thermal energy storage (TES) equipment cannot be 100% efficient, their use means an overall energy loss, and the economic viability of their use must be determined by analyses of data on the economic effects to both utilities and customers. The Public Utilities Regulatory Policies Act (PURPA) sets forth rather precisely what data are to be gathered in order to determine the cost causative factors of serving different types of consumers so that rates may more closely track costs and give the proper price signals to consumers. It is concluded that alternative energy technologies will each have their place in the overall energy picture. No one technology is going to work in each section of the US or for each class of customers. Where each technology is going to work best still remains to be defined. PURPA has given both utilities and industry the opportunity to formulate the necessary definitions.

18724 (CONF-790748—, pp 162-165) **Thermal energy storage and the regulatory environment.** Reinbergs, M. 1979. NTIS, PC A08/MF A01.

From Conference on peak load pricing and thermal energy storage; Chicago, IL, USA (15 Jul 1979).

The effects of marginal cost based pricing, peak-load pricing, and current regulations on utility pricing methods on the implementation of residential thermal energy storage equipment are discussed. It is concluded that marginal cost based pricing and peak load pricing will, along with direct load management rates, greatly enhanced the market for TES. The prognosis for widespread applications is poor for the present due to needed regulatory reform that will take time to accomplish. The adoption of mandatory TOD rates or optional TOD rates with inverted standard rates could greatly increase the potential especially for space cooling and higher technology efficient space heating. All applications could benefit from a national TES association able to provide expert witnesses for rate case interventions. (LCL)

18725 (CONF-790748—, pp 166-169) **Commercialization of electric storage heating.** DeGrasse, R.V. 1979. NTIS, PC A08/MF A01.

From Conference on peak load pricing and thermal energy storage; Chicago, IL, USA (15 Jul 1979).

Time-of-use (TOU) and time-of-day (TOD) rates of several different types are now being offered to residential and commercial customers by a rapidly growing number of electric utilities across the country. According to the results of an Edison Electric Institute survey, utilities in 32 states have TOU rates in effect or filed with their respective utility commissions. TOU rates represent a significant change in electricity pricing and will have an important effect on how future utility customers use electricity. An experience with electric storage heating and load control systems is presented from the view of a manufacturer who, since 1974, has been designing, manufacturing, and marketing storage heating equipment for use under TOU rates. It is stated that the single most important initiative that can be taken to further the commercialization of the TES systems in all their configurations is for government to give the same attention to thermal energy storage that it has given to solar, wind, and other alternative energy systems. A more widespread public commitment accompained by various electric industry education and demonstration programs is required if TES systems commercialization is to be accelerated. The adoption of TES systems will take place without government help because TES market economics exist where most TOU rates exist, but it will take years longer. It is the author's opinion that US dependency on

foreign oil can be reduced faster with widespread adoption of the TES system and TOU rates than with solar systems, particularly in view of the current oil heating situation and the effort utilities are making to reduce use of oil-fired peaking facilities.

2508 Chemical

REFER ALSO TO CITATION(S) 18489, 18933

2509 Batteries

REFER ALSO TO CITATION(S) 18928, 18929, 18933, 18934

18726 **(ANL/OEPM—80-6) Transient current distributions in porous zinc electrodes in KOH electrolyte.** Liu, M.B.; Yamazaki, Y.; Cook, G.M.; Yao, N.P. (Argonne National Lab., IL (USA)). Feb 1981. Contract W-31-109-ENG-38. 74p. NTIS, PC A05/MF A01.

A zero-resistance ammeter circuit with a 10-channel operational amplifier was used to measure the current distribution during a discharge of 10 to 100 mA with simulated zinc porous electrodes in 7.24 M KOH saturated with ZnO. The reaction distribution was found to be highly nonuniform, with 70 to 78% of the charge transfer reaction completed in a depth of 0.01 cm. The high nonuniformity of the initial reaction profile was believed to be due to low conductivity of the electrolyte in the electrode pores. The current distribution changes during passivation of the electrode were experimentally obtained. A mathematical model based upon a macroscope averaging technique was used to predict the time dependence of charge transfer reaction profiles. With mathematical model, current distributions and overpotentials were predicted as a function of time for the segmented zinc electrode discharged at a current of 10 to 100 mA; for these predictions, assumed values of both precipitation rate constants for porous ZnO and diffusion coefficients for hydroxide and zincate ions were used. A gradual decrease in the specific conductivity of the pore electrolyte to 20% of the initial value during discharge yields predictions of current distributions and overpotentials in good agreement with the experimental data. The extent of reduction in the specific conductivity of the pore electrolyte implies a supersaturation of zincate of four times chemical saturation, which was been observed experimentally.At high discharge current (25 to 100 mA), the passivation behavior of the electrode has been simulated. The results of the experiments and mathematical model show that the effective reaction penetration depth is less than 0.02 cm.

18727 **Use of tetravalent sulfur in molten chloroaluminate secondary batteries.** Mamantov, G.; Marassi, R.; Matsunaga, M.; Ogata, Y.; Wiaux, J.P.; Frazer, E.J. (Univ of Tenn, Knoxville). *Journal of the Electrochemical Society ;* **127**: No. 11, 2319-2325(Nov 1980).

A new rechargeable cell Na/Na/sup +/ ion conductor/ SCl_3^+ in molten AlCl/sub 3/-NaCl is described. This cell operates at temperatures in the range of 180°-250°C and has an open-circuit voltage of 4.2V. The discharge process involves the reduction of tetravalent sulfur to the elemental state; sulfur can be further reduced to sulfide. The preferred sodium ion conductor is /beta/sub d/ouble prime/-alumina. High energy density values, large percent utilization of the active material, and good energy efficiency have been demonstrated. The performance of cells prepared in the discharged and charged states were found to be the same. The number of deep charge/discharge cycles has exceeded 400. This study is applicable to electric vehicles. 54 refs.

18728 **Ternary compound electrode for lithium cells.** Raistrick, I.D.; Godshall, N.A.; Huggins, R.A. (to Dept. of Energy). US Patent Application 173,554. 30 Jul 1980. 20p.

Lithium-based cells are promising for applications such as electric vehicles and load-leveling for power plants since lithium is very electropositive and of light weight. One type of lithium-based cell utilizes a molten salt electrolyte and normally is operated in the temperature range of about 350 to 500°C. Such high temperature operation accelerates corrosion problems. The present invention provides an electrochemical cell in which lithium is the electroactive species. The cell has a positive electrode which includes a ternary compound generally represented as Li-M-O, wherein M is a transition metal. Corrosion of the inventive cell is considerably reduced.

18729 **Molten salt lithium cells.** Raistrick, I.D.; Poris, J.; Huggins, R.A. (to Dept. of Energy). US Patent Application 170,254. 18 Jul 1980. 16p.

Lithium-based cells are promising for applications such as electric vehicles and load-leveling for power plants since lithium is very electropositive and light weight. One type of lithium-based cell utilizes a molten salt electrolyte and is operated in the temperature range of about 400 to 500°C. Such high temperature operation accelerates corrosion problems and a substantial amount of energy is lost through heat transfer. The present invention provides an electrochemical cell which may be operated at temperatures between about 100 to 170°C. The cell is comprised of an electrolyte, which preferably includes lithium nitrate, and a lithium or lithium alloy electrode.

29 ENERGY PLANNING AND POLICY

REFER ALSO TO CITATION(S) 18867, 19381

2901 Energy Analysis And Modeling

REFER ALSO TO CITATION(S) 18734, 18739, 18827, 18886, 18903

18730 **(LBL—11154) Energy in the Pacific Coastal Zone: does D.O.E. have a role.** Ritschard, R.L.; Haven, K.F.; Cherniss, J. (Lawrence Berkeley Lab., CA (USA)). Sep 1980. Contract W-7405-ENG-48. 41p. NTIS, PC A03/MF A01.

This paper addresses the energy-related activities in the Pacific Coastal Zone within the context of the absence of a coastal-specific energy policy, as mentioned above. First, the present and projected coastal energy activities are described in order to establish a perspective of the importance of the coastal zone to energy development, transport, and use. Next, the state and federal decision-making processes relevant to coastal energy activities are summarized for the purpose of defining the institutional framework that has been constructed to respond to coastal energy issues. Finally, the functional areas not currently being adequately addressed are identified; and an associate role, which ensures both comprehensive evaluation and sound development of regional coastal energy resources, is defined for the DOE Office of Environment.

2902 Economics And Sociology

REFER ALSO TO CITATION(S) 18035, 18252, 18253, 18736, 18750, 18756, 18845, 18870, 18871, 18898, 19245, 19246, 19587

18731 **An econometric model of wastepaper recycling in the USA.** Gill, G.; Lahiri, K. (Univ of Florida). *Resources Policy ;* **6**: No. 4, 320-325(Dec 1980).

Presented is an estimated simultaneous model of the wastepaper market that describes supply and demand in the U.S. during 1952-74. The volatile nature of wastepaper prices is explained. While consumption of paper and paper products has risen 144% since 1950, the role of recycled paper has declined from 33% during 1940-44 to 16.7% in 1975. Demand for wastepaper is derived primarily from shortages at mills. The recycling effort will not be stimulated by the elimination of differential rail freights or preferential tax treatment of stumpage profits. (2 tables)

2903 Environment, Health, And Safety

REFER ALSO TO CITATION(S) 18265, 18266, 18341, 18730, 18749, 19208,

19211, 19247, 19380

2904 Natural Resources

REFER ALSO TO CITATION(S) 17940, 18162, 18302, 18364, 18768

2905 Research, Development, Demonstration, And Commercialization

REFER ALSO TO CITATION(S) 18148, 18738, 18740, 18751, 18754, 18773, 18906, 19370

18732 (DOE/TIC—3385) Appropriate technology: a bibliography. Thompson, L.M. (ed.). (Department of Energy, Oak Ridge, TN (USA). Technical Information Center). Mar 1981. 56p. NTIS, PC A04/MF A01.

This bibliography of 191 citations and abstracts contains the entries on the subject that appear in the DOE Energy Data Base as of February 28, 1981. The citations are arranged by subject category, with each category first ordered alpha-numerically by report number followed by an inverse chronological order for books, monographs, and journals. Corporate, Author, Subject, Contract Number, and Report Number indexes follow the abstracts.

18733 (UCRL—15342) Private sector technology transfer. Final report. (Lawrence Livermore National Lab., CA (USA)). Jan 1981. Contract W-7405-ENG-48. 12p. NTIS, PC A02/MF A01.

It was the purpose of this project to design and operate a service within the Santa Clara Chamber of Commerce which could represent the private sector in the Federal Laboratory Consortium (FLC) technology-transfer process. It was also the purpose of this project to experimentally demonstrate the value of technology transfer and utilization to the private sector and small-business community. The basic premise of the Technology Action Center (TAC) is that successful technology transfer requires active participation on the part of both the technology supplier and user. The technology suppliers within the Federal government are represented by the FLC. The TAC is designed to effectively represent the potential user of Federally developed technology. The Chamber of Commerce was chosen as a sponsoring agency to achieve economy of scale as well as to eliminate any chance of providing an unfair advantage to individual firms concerning the utilization of government-developed technology. The project was initiated in the summer of 1978 and has been in operation since that time. The results of the TAC's efforts have been mixed. When specific requests have been received by the TAC Coordinator, the process has worked well and the potential user has been happy with the results. The single most-apparent failure of the project has been its inability to develop a sustained increase in User Demand which is essential to the TAC's success. Project description, status, and evaluation are presented briefly, followed by conclusions and recommendations.

18734 (UCRL—53114) Energy and Resource Planning Group FY 1980. Annual report, March 1, 1981. Rubin, B. (ed.). (Lawrence Livermore National Lab., CA (USA)). 1 Mar 1981. Contract W-7405-ENG-48. 18p. NTIS, PC A02/MF A01.

A brief summary is presented of the activities and formal reports of the LLL's Energy and Resource Planning Group in FY 1980, during which the Group continued its assessments of national and regional energy issues using the Livermore Energy Policy Model, prepared energy flow diagrams for the US and for California, studied possible US responses to a Middle Eastern oil cutoff, and conducted an econometric study of the relationship between energy use and total US energy output. A large effort went into assessing the status of foreign energy technologies. The Group continued to implenent technology transfer to state and local agencies and maintained an ongoing interest in the relationship among R & D, innovation, and national productivity.

2906 Nuclear Energy

REFER ALSO TO CITATION(S) 18071, 18130, 18570, 18571, 18572, 18573, 18574, 18575, 18595, 18605, 18606, 18607, 18608, 18609, 18617, 18618, 18619, 18620, 18621, 19246, 19584

2907 Transport And Storage

REFER ALSO TO CITATION(S) 18919, 18922, 18930, 18931, 18932, 18940, 18941, 18944, 18946, 18948

2908 Waste Heat Utilization

REFER ALSO TO CITATION(S) 18718, 18817, 18822, 18830, 18852, 18869, 18908

18735 Cogeneration: what's ahead?. Streb, A.J. (US DOE, Washington, DC). *Energy Engineering ;* 77: No. 3, 11-23(Apr-May 1980).

The author shows how industrial power and heat can be produced by the same source for significant energy savings. The Department of Energy's plan for nationwide implementation of this idea is discussed. 5 refs.

2910 Conservation

REFER ALSO TO CITATION(S) 18041, 18369, 18370, 18718, 18742, 18743, 18747, 18816, 18821, 18822, 18823, 18824, 18826, 18829, 18831, 18835, 18839, 18840, 18849, 18862, 18863, 18864, 18865, 18866, 18869, 18870, 18871, 18872, 18875, 18876, 18885, 18886, 18887, 18898, 18900, 18911

18736 (CONF-800966—, pp 167-174) Consumers and energy efficiency: how do they choose. Redinger, R. (Carnegie-Mellon Univ., Pittsburgh, PA). 1980. NTIS, PC A09/MF A01.

From Conference on waste heat recovery for energy conservation: residential and light commercial heat pumps; West Lafayette, IN, USA (15 Sep 1980).

An attempt made to market energy conservation through the development of more energy efficient products and through appeals to conserve energy via behavioral change and/or capital investments is discussed. Included among the possible investment models available to the consumer to use in making an investment decision are: a payback model; an internal rate of return model; a life cycle costing model; and a net present value model. These are discussed in detail. The process of the consumer's choice is followed. To discuss the payback model as useful in predicting choice, measurement of payback, payback as a predictor, payback as a segmentation tool, and the effects of market forces on payback are examined. (MCW)

18737 (CONF-8005155—1) Overview of Department of Energy programs to stimulate new industrial techniques. Evans, A.R. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 8p. NTIS, PC A02/MF A01.

From 2. annual industrial program grantee conference; Hot Springs, AR, USA (14 May 1980).

With the objectives of the US DOE to provide for the orderly and adequate supply of fuels to the nation's industry and the efficient use of these fuels by industry, a review is presented of DOE programs related to these objectives. The objective of the programs is to accelerate the availability and adoption of existing and new industrial techniques for increased energy efficiency or fuel substitution. Also described are some of the ways in which academic researchers cooperate with industry and DOE in carrying out these programs. Several topics for further research are suggested. (MCW)

18738 (EPA/600/7—81-001) Review of the Department of Energy's conservation and solar energy programs: a report to the President and Congress. (Environmental Protection Agency, Washington, DC (USA)). Jan 1981. 79p. United States Environmental Protection Agency, Washington, DC.

The findings of the US EPA concerning the mandate in Section 11 of the Federal Nonnuclear Energy Research and Development Act (P.L. 93-577) to conduct a continuing analysis of the

effect of the application of nonnuclear energy technologies to evaluate the adequacy of attention to energy conservation methods and the adequacy of attention to environmental protection and the environmental consequences of the application of energy technologies are given. Adequacy of attention to energy conservation was measured in three ways: adequacy of the resource allocation process; assessment of implementation and management (integration of conservation and solar programs, coordination of information programs, appropriate management of state and local programs and research and development); and adequacy of evaluative information for decision making. Information on public participation; conservation and solar program evaluations are given in appendices.

2920 Supply, Demand, And Forecasting

REFER ALSO TO CITATION(S) 17967, 18035, 18746, 18748, 18752, 18770, 18888

18739 **(EPRI-EA—1541-SR) Alternative futures: choices and uncertainties.** Niemeyer, E.V. (Electric Power Research Inst., Palo Alto, CA (USA)). Apr 1981. 85p. NTIS, PC A05/MF A01.

The results of three separate analyses of alternate futures for the US emphasizing the possibilities for the economy, energy system, and electric power sector are reported. The three sets of analyses examined the future over short-, intermediate-, and long-run time frames using the Wharton Model, Dale W. Jorgenson Associates Modeling System, and ETA-MACRO energy/economy models. The analyses were linked through common assumptions and scenario structures. The scenarios were designed to show the role of alternative choices (social and governmental) and alternative independent occurrences (factors beyond our control) in determining the future. The results show that the future depends more heavily on our choices than on independent occurrences.

18740 **(P—500-81-016) Exploring new energy choices for California: the 1981/82 report to the legislature. Staff report.** (California Energy Commission, Sacramento (USA)). Mar 1981. 92p. California Energy Commission, Sacramento, CA.

The research and development activities of the California Energy Commission are examined. The activities include programs on: the Energy Development Program, a program to accelerate the use of alternative energy resources and technologies which are available for near-term application in California; the Regulatory and Planning Program, a program seeking to develop a technical and assessment capability to understand underlying trends, choices, and strategies which affect energy supply and demand; and the Energy Resources Conservation Program, a program involving commercialization activities to increase appliance efficiency. Accomplishments over the past year in solar energy; wind energy; energy from biomass and synthetic fuels; geothermal energy; cogeneration; and small hydroelectric are summarized. Major accomplishments of the Regulatory and Planning Program are: demand assessments; systems assessment; technology assessment; fuels assessment; and locational analysis. (MCW)

18741 **Energy consumption in the U.S.A. and expectations for the future.** Tassicker, O.J. (EPRI, Palo Alto, Calif). pp 174-186 of Proceedings--region 6 conference, the 1980's--a forest of energy decision trees. Piscataway, NJ; IEEE (1980).

From IEEE Region 6 conference; San Diego, CA, USA (20 Feb 1980).

Electricity generation will have to be expanded according to the authors from its present installed capacity by a factor of about two and one-half times to 1300 GW by the year 2000. This will provide for an energy generation of 6 trillion kWhr in that year regarded as a target for modest economic growth in the USA. Coal and nuclear power appear to represent the only proven and domestically abundant options which can be relied upon to meet growing electricity demands during the next several decades. 4 refs.

18742 **International energy strategies.** Dunkerley, J. (ed.). Cambridge, MA; Oelgeschlager, Gunn & Hain, Publishers, Inc. (1980). 495p. (CONF-7906202—).

From IAEE/RFF international energy strategies conference; Washington, DC, USA (4 Jun 1979).

The sharp rise in oil prices and the embargo of 1973 to 1974 stimulated a growing interest in international energy questions. One indicator of this interest was the decision in late 1977 to establish an International Association of Energy Economists (IAEE). In 1979 the officers of the IAEE proposed to hold not only an initial annual meeting of the association, but also a two-day Conference on International Energy Issues. Resources for the Future, a Washington-based independent research institute, was asked to cosponsor the two-day conference. These two meetings were held in Washington, DC, on June 4, 5, and 6, 1979. This volume contains the 34 papers of the proceedings, and a separate abstract was prepared for each paper for Energy Abstracts for Policy Analysis (EAPA); 13 papers were selected for Energy Research Abstracts (ERA).

18743 **Paths to energy conservation in industrial countries.** Reddington, J. pp 119-128 of International energy strategies. Dunkerley, J. (ed.). Cambridge, MA; Oelgeschlager, Gunn & Hain, Publishers, Inc. (1980).

From IAEE/RFF international energy strategies conference; Washington, DC, USA (4 Jun 1979).

Some observations are made on energy-demand management, or conservation, as it has been practiced or perceived in the OECD community of industrial countries in the present era of higher energy prices. Varying performance in Japan, Germany, Belgium, and Italy are specifically compared because of their different government policy stance toward demand management, as well as different degrees of economic strength and growth. Energy conservation is examined in the perspective of the overall work of the International Energy Agency.

2930 Policy, Legislation, And Regulation

REFER ALSO TO CITATION(S) 18252, 18742, 18760, 18768, 18864

18744 (CONF-800483—(Vol.1), pp 156-157) **Industry's role: action or reaction.** Aspenson, R.L. (3M Co., St. Paul, MN). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Industry has a responsibility to voice concerns, share technical knowledge, and contribute to effective energy legislation. It must get involved in the rule-making proceedings of the regulatory process. The principal legislative and regulatory energy issues are described, and what the 3M company is doing to impact on them is shown.

18745 **(CONF-810444—1) PURPA and associated technical issues.** Reddoch, T.W. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 4p. NTIS, PC A02/MF A01.

From International conference on electric energy; Oklahoma City, OK, USA (13 Apr 1981).

The Public Utilities Regulatory Policies Act (PURPA) has provoked much interest and controversy since its passage in 1978 as well as the subsequent interpretations by the Federal Energy Regulatory Commission (FERC) in 1980. The rulings by FERC have not been totally effective in clarifying some of the critical issues which have plagued the electric utility industry and the public. Both PURPA and the FERC rulings are reviewed with particular emphasis on important technical issues which are alluded to by the rulings but have not been clearly resolved. Some insight is given on critical intertie issues.

18746 **Energy policy and federalism.** Thur, L.M. (ed.). Toronto, Ontario; The Institute of Public Administration of Canada (1981). 191p. (In several languages). (CONF-8005153—).

From International seminar on energy policy and federalism in North America; Banff, Alberta, Canada (14 May 1980).

Separate abstracts are prepared for six papers presented as the product of an international seminar on Energy Policy and Federalism in North America. Specially commissioned papers for the seminar are presented along with a summary of the discussions. The summary appears in English, French, and Spanish; the other papers are in English. (MCW)

18747 **DOE's alternative fuel policy.** Blum, E.H. (US DOE, Washington, DC). *Consulting Engineer (Barrington, Ill.)* ; **55**: No. 6, 55-58(Dec 1980).

The Department of Energy's Director of Advanced Technology Policy reviews the overall current plans to reduce the country's dependence on the OPEC cartel. The department's program is in two phases: the short term aims to reduce imports and lower the costs of possible disruption of oil deliveries, while the long term strives to shift the economy from dependence on oil and gas to the use of coal, oil shale, nuclear energy, and renewable resources.

18748 **Energy policy now.** Rampton, J. pp 19-28 of International energy strategies. Dunkerley, J. (ed.). Cambridge, MA; Oelgeschlager, Gunn & Hain, Publishers, Inc. (1980).

From IAEE/RFF international energy strategies conference; Washington, DC, USA (4 Jun 1979).

The world energy problem and the uncertainty of the energy scene are examined. It is suggested that the uneven distribution of energy sources, the long lead times for their development, the risks of producing and using energy, and the political factors that may constrain its availability all conspire to increase that uncertainty. A number of ways in which any one country or group of countries can reduce these risks are mentioned with specifics on the situation in the UK. (MCW)

2940 Fossil Fuels

REFER ALSO TO CITATION(S) 17927, 17927, 17940, 17943, 17945, 17946, 17958, 17965, 17967, 18030, 18030, 18035, 18036, 18039, 18041, 18770, 18872, 19245, 19370

18749 (EPA/600/7—79-217, pp 43-58) **Department of Energy environmental assessment program for coal conversion.** Witmer, F.E. (Environmental Control Tech. Div., Washington, DC). Sep 1979. NTIS.

From EPA fuel conversion symposium; Hollywood, FL, USA (17 Apr 1979).

Implicit in the US Department of Energy's (DOE) charge to foster the development of commercially viable coal gasification and liquefication processes is the requirement that this technology be environmentally acceptable. While wide-scale use of this technology over the next several decades is not predicted, synfuel alternatives such as coal conversion will significantly contribute to domestic energy supply over the long term. DOE's environmental assessment activity, oriented toward evaluating the environmental impact ultimately associated with a sizeable synthetic fuels industry, is conducted to guide here-and-now RD and D and policy decisions. A series of time-phased environmental assessments parallel the development and scaleup of the technology. Major areas of environmental concern and uncertainty are singled out in NEPA documentation that accompanies scaleup activity. Environmental concerns that go beyond current regulatory and siting requirements for energy technologies are addressed in DOE documents including environmental development plans that are prepared for each emerging technology. Individual, detailed project milestones require formalized environmental status reports to ensure that environmental concerns and issues are satisfied. Because complex technical, economic, and public issues are at stake, conclusions tend to be judgmental and, of course, are sensitive to the scenario under consideration. DOE has a complement of interdepartmental and intradepartmental activities to expand the data base, both in the field and in terms of studies, to improve the analysis process and the credibility of the assessments. This presentation will overview these evolving assessment processes.

18750 **(NP—25381) Environmental Impact Statement. Public hearing, Lake Guntersville State Park.** (Tennessee Valley Authority, Guntersville, AL (USA). Coal Gasification Project). 23 Sep 1980. 166p. NTIS, PC A08/MF A01.

This report is a transcript of a public hearing on the TVA proposed coal gasification plant for inclusion in the final Environmental Impact Statement.

18751 **(P—300-80-037) Availability of western coal for California use. Final report.** St. Clair, A.E.; Davis, R.J.; Gavande, S.A.; George, F.M.; Hamilton, E.P. III; Harner, D.D.; Leonard, R.L.; McMurry, J.B.; Sherrill, K.T.; Wilson, M.L. (California Energy Commission, Sacramento (USA)). Nov 1980. 595p. California Energy Commission, Sacramento.

The supply of western coal and factors affecting the availability of that coal for use in electric power generation in California were investigated for the California Energy Commission. Principal areas of investigation included coal resources, coal supply and demand, transportation, federal coal leasing, the Surface Mining Control and Reclamation Act (SMCRA) and regulatory program, socioeconomic impacts, environmental impacts, and health and safety impacts. No potentially major constraints to obtaining coal in California were identified, although several areas of uncertainty may affect coal availability and price. These areas of uncertainty include development of a new federal coal leasing policy and interpretation of several provisions of SMCRA (such as designation of lands unsuitable for mining, protection of alluvial valley floors and prime farmlands, and protection of hydrologic balance). A detailed evaluation of rail capacity in the western rail network demonstrated that the existing system can accommodate increased traffic due to California's postulated Boal demand with only normal upgrading. Socioeconomic, environmental, and health and safety impacts will occur in western coal producing areas as a result of increased demand, but do not appear to pose significant limitations on coal supply.

18752 (P—300-81-002, pp 245-253) **International sharing agreements and DOE's oil contingency planning.** Taylor, W.B. Jr. Jan 1981. California Energy Commission, Sacramento.

From Symposium on California and world oil: the strategic horizon; Los Angeles, CA, USA (17 Jul 1980).

The D.O.E.'s contingency plan for energy disruptions is discussed. On the supply side, the Strategic Petroleum Reserve is designed to supply emergency fuel in case of severe supply shortages. Questions of allocations or rationing of energy supplies is discussed. Four alternate plans for allocation are presented. (DMC)

18753 **Overview of the repository program and the matrix approach to the health effects investigation of oil shale development.** Coffin, D.L. (Environmental Protection Agency, Research Triangle Park, NC); Guerin, M.R.; Griest, W.H. pp 1-6 of Health effects investigation of oil shale development. Griest, W.H.; Guerin, M.R.; Coffin, D.L.; (eds.). Ann Arbor, MI; Ann Arbor Science Publishers, Inc. (1981).

From Symposium on health effects investigations of oil shale development; Gatlinburg, TN, USA (23 Jun 1980).

The purpose of this program is to develop suitable methods and to provide timely infromation on the biological properties of important synfuels technology components. A secondary purpose is to evaluate the effectiveness of a repository/matrix approach to carrying out such studies. To this end, the US Environmental Protection Agency and the US Department of Energy are cooperating with the US Department of Defense, Development Engineering, Inc., the Standard Oil Company of Ohio (SOHIO), and the American Petroleum Institute in a concerted study of shale-derived crude and refined petroleum substitutes originating form above ground retorting using the Paraho Process. This investigation is unique in at least three ways. First, it enjoys the close cooperation of an especially diverse group of agencies, institutions, and perspectives. Second, it involves the study of samples form a large scale (100,000 bbl) production and refining experience. Third, it relies on mutual scientific interests and exchanges of materials and results for continuing progress rather than on programmatic funding and direction. The term matrix derives from a series of investigators studying a common series of materials. The investigators constitute one axis of the matrix and the samples studied constitute the other axis of the matrix. The results of a diverse number of groups focusing on diverse issues are made interrelatable by the fact that they examine or use a common set of samples.The repository, or information exchange, facility is located at ORNL. Repository responsibilities include recruiting participants for matrix studies, disseminating research results, and providing special services. (DMC)

18754 **Paraho operations.** Heistand, R.N. (Paraho Development Corp., Grand Junction, CO). pp 7-13 of Health effects investigation of oil shale development. Griest, W.H.; Guerin, M.R.; Coffin, D.L.; (eds.). Ann Arbor, MI; Ann Arbor Science Publishers, Inc. (1981).

From Symposium on health effects investigations of oil shale development; Gatlinburg, TN, USA (23 Jun 1980).

The accomplishments of the Parahoe operations during a 2 year period under an Office of Naval Reserve, DOE contract are summarized. Research studies performed at Anvil Points are described. Paraho's association with the ORNL repository is also discussed. (DMC)

18755 **Synthetic fuels in California: resolving uncertainties.** Sacramento, CA; California Energy Commission (1980). 109p. (NP—25373).

The combination of many unresolved issues and normal construction and debugging problems associated with new large-scale manufacturing plants means that the lead time to achieve significant synfuels production is five to 10 years or more depending upon the feedstock used. Thus, if synfuels are to be available, even as a continuing option for foreign oil displacement, the development process should be accelerated now, albeit cautiously and deliberately. This paper, therefore, assumes that synfuels will likely be needed on a commercial scale in the state's energy mix. Based on this assumption, it identifies and discusses technical issues and uncertainties surrounding synfuels manufacturing and marketing. It recommends a number of government and utility actions designed to help resolve these technical uncertainties to allow a more definitive determination of synfuels' future role in California's energy mix and thus state government's appropriate role in synfuels development.

18756 **Refinery policy in the 1980s: security, economics and equity.** Silber, B.; Feldman, C.R. (eds.). Washington, DC; Americans for Energy Independence (1980). 122p. (NP—25383).

The edited proceedings of a conference addressing the question of foreign vs domestic oil refining are presented. Trading dependence on foreign crude oil for dependence on foreign refined products is resulting because US refineries are not able to handle the demand for petroleum products even if operating at capacity. The cost involved in building up the US refinery capacity is weighed against last employment, detrimental balance of payment, inflation, and national security risks due to dependence on foreign refineries. Questions of converting present refineries geared to process light, sweet oils to the processing of heavy, sour crudes are also discussed. (DMC)

2950 Hydrogen And Synthetic Fuels

REFER ALSO TO CITATION(S) 18951

2960 Electric Power

REFER ALSO TO CITATION(S) 18147, 18149, 18150, 18151, 18152, 18154, 18155, 18156, 18157, 18158, 18159, 18160, 18161, 18164, 18169, 18171, 18173, 18174, 18175, 18176, 18177, 18178, 18179, 18184, 18185, 18186, 18187, 18188, 18189, 18190, 18191, 18192, 18204, 18205, 18208, 18209, 18211, 18212, 18218, 18219, 18221, 18222, 18223, 18224, 18225, 18226, 18227, 18228, 18229, 18230, 18231, 18232, 18233, 18235, 18236, 18237, 18238, 18522, 18542, 18568, 18708, 18709, 18710, 18711, 18712, 18713, 18714, 18719, 18720, 18721, 18722, 18723, 18724, 18725, 18742, 18812, 18868, 18907, 18909

18757 (CONF-790748—, pp 41-51) **Role of the electric utility in the US energy future.** Corey, G.R. 1979. NTIS, PC A08/MF A01.

From Conference on peak load pricing and thermal energy storage; Chicago, IL, USA (15 Jul 1979).

The financial problems facing the US electric power industry, particularly as oil-fired generating facilities are converted to or replaced by units with other fuel forms, conventional original cost rate regulation, and the suitability of his type or rate regulation in an inflationary environment are discussed. The need for rate regulatory are discussed. The need for rate regulatory reform is stressed. It is concluded that if we as a nation are unwilling to pay as much for electricity as it costs ot provide it, our needed electric facilities will have to be provided by government institutions and supported with increased taxes. Meanwhile, if inflation continues and electricity utility earnings deteriorate further, I fear that we will enter the late 1980's short on electric supply facilities and then there will be a crash program to install additional oil-fired electric generation - which can only serve to further exacerbate our oil supply and balance-of-payment problems. (LCL)

18758 (CONF-791056—, pp 69-78) **Future role of hydropower in the world energy context.** Armstrong, E.L. 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The advantages of hydropower, worldwide forecasts on energy needs for the developing and developed countries and factors affecting the worldwide development of hydropower are discussed. (LCL)

18759 (CONF-791056—, pp 79-82) **Waterpower: an agenda for the 80's.** Gravel, M. (Senate, Washington, DC). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

After stating the need for energy price controls on oil and gas and for judging the merits of solar and nuclear energy and synthetic fuels for meeting US energy demand, it is declared that hydroelectric power is one of the more viable short-term alternative energy sources. Bills introduced in the Senate to accelerate the development of small scale hydropower plants are mentioned, and the need for more rapid implementation of hydro projects by changes in licensing procedures are discussed. (LCL)

18760 (CONF-791056—, pp 646-651) **Policy recommendations for Federal and state governments to ease financial constraints on limited resource hydropower developers.** Holland, J.K. (Berger Associates, Camp Hill, PA). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

Recommendations are made for changes in Federal and state policies in order to ease the financial constraints on the development of small hydropower plants by developers with limited resources. These recommendations include aid to the developer in performing feasibility studies, reducing the burden of licensing procedures, financial aid, and tax credits.

18761 (CONF-791056—, pp 715-718) **Social implications of hydroelectric energy.** Waring, J.A. 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The past and present role of energy in the American way of life, the contribution that hydroelectric power does and can further contribute to the supply of electrical energy, and the advantages and disadvantages of hydropower are discussed. (LCL)

18762 (CONF-791056—, pp 743-747) **Small-scale hydropower generation in non-oil-producing developing nations: some policy issues.** Ahimaz, F.J. (Cornell Univ., Ithaca, NY). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

Government policies, usually conceived at the highest government level, that have impeded the development of small-scale hydropower in developing countries are discussed using Afghanistan as a specific example. (LCL)

18763 (CONF-791056—, pp 782-795) **Micro-hydro as an appropriate technology in developing countries.** Armstrong-Evans, R.J. (Evans Engineering, Cornwall, England). 1979. NTIS, PC A99/MF A01.

From Waterpower 79 international conference: small scale hydropower; Washington, DC, USA (1 Oct 1979).

The design, installation, control equipment, maintenance and operation of microscale hydro generating equipment, and the applicability of these simple, standardized, nearly maintenance-free units

for use in developing countries, using Nepal as an example, are discussed. (LCL)

18764 (EPRI-EA—1775) Industry and economic impacts of restrictions on the growth of generating capacity. Interim report. Hudson, E.A.; Kimball, C.E.; O'Connor, D.C. (Jorgenson (Dale W.) Associates, Cambridge, MA (USA)). Apr 1981. 173p. NTIS, PC A08/MF A01.

The effects on the electric power industry, the energy system and the US economy of restrictions on coal and nuclear generating capacity, of higher costs for new generating capacity and of higher fuel prices are examined. The analysis covers the period to 2000 and uses electricity-energy-economy simulation models to examine a wide range of different combinations of these restrictions and price increases. Each type of energy restriction is found to impose substantial costs on the electric power industry and electricity consumers, on the energy system, and on incomes and production throughout the economy. It is significant that restrictions or cost increases imposed on the electric power industry lead to repercussions and costs throughout the energy and economic systems, impacting even those not directly associated with the electric power industry. The nature of the costs is also significant - restrictions on the electric power industry, as well as impacting industry performance and prices, can lead to large increases in oil and gas imports and to slower growth of total production and real incomes. Each of these involves serious costs, one in the form of increased risk of economic disruption and political constraints, the other in the form of production and income foregone. Increases in fuel prices are found to be potentially the most damaging energy change, although higher costs for generating capacity, restrictions on coal capacity and restrictions on nuclear capacity each result in substantial costs. Further, these costs are found to compound greatly when there are simultaneous restrictions.

18765 (EPRI-EL—1659(Vol.1)) Pool daily fuel scheduling. Volume 1: technical manual. Final Report, February 1981. Pang, C.K.; Mikolinnas, T.A.; Reppen, N.D.; Ringlee, R.J.; Wollenberg, B.F. (Power Technologies, Inc., Schenectady, NY (USA)). Feb 1981. 172p. NTIS, PC A08/MF A01.

The results and efforts of research and development of methods for daily fuel scheduling performed under EPRI Project RP 1048-5 by Power Technologies, Inc. (PTI) are reported in three volumes: Technical Manual, Programming Manual, and Program Listings. Daily fuel scheduling involves the scheduling and dispatching of generating facilities to meet all system loads and operating requirements for periods ranging from a day to a week. Daily fuel scheduling and computer requirements are defined. The scheduling problem is formulated as a mixed-integer linear programming (MILP) optimization problem in which the total system operating cost is minimized. A potentially practical scheduling procedure, based on a combination of search and MILP approaches, was proposed; these two approaches were investigated, coded in FORTRAN and tested individually. This volume of the report (Volume 1) is the Technical Manual and contains the main body of the report, which includes descriptions and results for two approaches to the daily fuel scheduling problem: Search Approach and Mixed Integer Linear Programming (MILP) Approach. Prototype computer programs on these approaches have been coded in FORTRAN for testing and evaluation purposes using PTI in-house PRIME time-sharing computer.

18766 (EPRI-EL—1659(Vol.2)) Pool daily fuel scheduling. Volume 2: programming manual. Final report, February 1981. Pang, C.K.; Mikolinnas, T.A. (Power Technologies, Inc., Schenectady, NY (USA)). Feb 1981. 229p. NTIS, PC A11/MF A01.

The results and efforts of research and development of methods for daily fuel scheduling performed under EPRI Project RP 1048-5 by Power Technologies, Inc. (PTI) are reported in three volumes: Technical Manual; Programming Manual and Program Listings. Daily fuel scheduling involves the scheduling and dispatching of generating facilities to meet all system loads and operating requirements for periods ranging from a day to a week. Daily fuel scheduling and computer requirements are defined. The scheduling problem is formulated as a mixed-integer linear programming (MILP) optimization problem in which the total system operating cost is minimized. A potentially practical scheduling procedure, based on a combination of search and MILP approaches, was proposed; these two approaches were investigated, coded in FORTRAN and tested individually. Tests using the New York Power Pool system show that the search approach may produce potential savings for fuel scheduling approaches. Additional efforts are needed to make the MILP approach practical. Finally, a number of special scheduling problems have been identified and recommended for future work. This volume of the report (Volume 2) is the Programming Manual which describes the organization and structure of the programs. Layout and function of data files, sample outputs and test data are also presented. Program organization and data for the search and MILP approaches are given. Preliminary test results, system data descriptions and sample outputs for the search approach are included in the appendices.

18767 (EPRI-EL—1659(Vol.3)) Pool daily fuel scheduling. Volume 3: Program listings. Final report, February 1981. Pang, C.K.; Mikolinnas, T.A. (Power Technologies, Inc., Schenectady, NY (USA)). Feb 1981. 450p. NTIS, PC A19/MF A01.

The results and efforts of research and development of methods for daily fuel scheduling performed under EPRI Project RP 1048-5 by Power Technologies, Inc. (PTI) are reported in three volumes: Technical Manual; Programming Manual and Program Listing. Daily fuel scheduling involves the scheduling and dispatching of generating facilities to meet all system loads and operating requirements for periods ranging from a day to a week. Daily fuel scheduling and computer requirements are defined. The scheduling problem is formulated as a mixed-integer linear programming (MILP) optimization problem in which the total system operating cost is minimized. A potentially practical scheduling procedure, based on a combination of search and MILP approaches, was proposed; these two approaches were investigated, coded in FORTRAN and tested individually. Tests using the New York Power Pool system show that the search approach may produce potential savings for fuel scheduling approaches. Additional efforts are needed to make the MILP approach practical. Finally, a number of special scheduling problems have been identified and recommended for future work. This volume of the report (Volume 3) gives the FORTRAN listings of the programs, which had been developed during the course of this project. In the programs, there may be certain statements and functions which could be specific to the PRIME computer system. Comments on them are provided.

18768 Electricity tomorrow. 1981 final report to the governor and the legislature. Sacramento, CA; California Energy Commission (1981). 487p. (NP—25374).

The California Energy Commission's views on the critical issues for the electricity sector in California are presented. The report includes the Commission's adopted level of electricity demand and its adopted policies and supply criteria. Together, these form the basis for planning and certification of electric generation and transmission facilities by the Energy Commission. It also includes estimates of the potential contributions of conservation and various conventional and alternative supply sources, critiques of utility supply plans, and determinations of how much new capacity is required. Finally, the report presents policy recommendations for directing public and private investments into preferred energy options, for spreading the benefits and costs of these options broadly and fairly among California's citizens, and for removing remaining obstacles to the development of all acceptable energy sources. It is based on extensive Commission hearings and analysis by CEC staff, the utilities, and others.

18769 (NP—25323) Electric Utility Rate Design Study: the accounting-cost basis for evaluating block rates. (Main (Charles T.), Inc., Boston, MA (USA)). 14 Apr 1980. 51p. EPRI, Palo Alto, CA.

This document proposes, explains, and applies a methodology for developing block rate structures based on accounting costs. A framework for evaluating the block rate structure requires developing a relationship between consumption and cost of service. Accounting cost is defined as the summation of those cost entries made in the books of account by a company using accepted utility-accounting procedures, plus a fair return on invested capital. Ac-

counting costs are determined for a twelve-month period (test year) and may include known and measurable changes from outside the test year, commission approved accounting adjustments, or near-term projections of costs (e.g., FERC Period II - next twelve months of operations). The procedure for evaluating a block rate for a particular customer group requires: (1) quantification of the nature (components) of electric service; (2) determination of the cost of each component (unit costs); (3) development of a relationship between consumption and the components of electric service; (4) application of the unit costs developed in (2) to the relationship developed in (3) to yield the desired relationship between consumption and cost; and (5) comparison of the relationship between consumption and cost with that between consumption and price. This paper discusses each of these steps in turn. (MCW)

18770 **Regional forecasting of the demand for fossil fuels by electric utilities in the United States.** Uri, N.D. (Office of Energy Use Analysis, Washington, DC). *Regional Science amp Urban Economics ;* **11**: No. 1, 87-100(Feb 1981).

The possibility of interfuel substitution in the generation of electrical energy exists. Given this fact, a demand model for various fossil fuels by electric utilities in the United States is developed. Using regional data, the results suggest that the responsiveness of the demand for coal, residual fuel oil, distillate fuel oil, and natural gas by electric utilities to relative price changes is significant. In a forecasting setting, the demand model performs remarkably well when actual and forecast values for 1979 are compared. 16 references, 5 tables.

18771 **Our top priority: expanded electrification will substantially reduce oil use while propelling economic recovery.** Felix, F. New York, NY; Gibbs and Hill, Inc. (1980). 16p. (CONF-8010176—1).

From Economy energy and electricity conference; Toronto, Ontario, Canada (14 Oct 1980).

Benefits resulting from increased use of electricity are discussed. Unique qualifications and benefits of increased use of electricity are documented in the areas of: conservation of energy, as a whole, and reduction of oil use; low energy costs in contrast to 7 to 15 times higher energy costs for imported oil; pacing of economic growth and job creation; greater national security, through lessened dependence on overseas oil; protection of the environment and better quality of life - working as well as residential; decreasing inflation, higher productivity, and a stronger dollar. It is suggested that electricity has been denied the recognition it deserves, the implementation of which would be the most constructive step possible toward approaching the goals of sustained economic and human progress, not only for Canada, the United States, and the other industrialized nations, but also for the entire world. (MCW)

2980 Consumption And Utilization

REFER ALSO TO CITATION(S) 18842, 18903

18772 **(ORNL/CON—72) Disaggregate energy consumption data: Federal/state cooperation.** Blue, J.L.; Hirst, E. (Oak Ridge National Lab., TN (USA)). May 1981. Contract W-7405-ENG-26. 38p. NTIS, PC A03/MF A01.

Purposes that energy consumption data can serve for all levels of government, if they are accurate, consistent, comprehensive, timely, accessible, and documented, are noted. The definition, design, collection, maintenance, validation, and use of energy-related data are described. The major conclusion is that improved and additional cooperation between Federal and state agencies could greatly increase the quality and relevance of the energy end-use data collected, which is needed for careful policy analysis, program design, and program evaluation. The basic steps associated with such cooperative efforts to develop better data collection systems are discussed.

2990 Unconventional Sources And Power Generation

REFER ALSO TO CITATION(S) 18240, 18242, 18243, 18252, 18253, 18255, 18263, 18264, 18265, 18266, 18276, 18285, 18307, 18313, 18314, 18323, 18324, 18342, 18347, 18355, 18357, 18360, 18365, 18369, 18437, 18439, 18499, 18505, 18508, 18523, 18526, 18527, 18528, 18738, 18842, 18850, 18851, 18905, 18910, 19199

18773 **Third World energy options and the role of the Solar Energy Research Institute.** Hayes, D.; Kadyszewski, J. (Solar Energy Research Inst., Golden, CO). *Natural Resources Forum ;* **5**: No. 2, 141-156(Apr 1981).

This paper presents information on the potential and current status of a range of solar technologies. The United States Solar Energy Research Institute (SERI) is advancing a number of technologies that will have direct impact on life in developing countries; but, in addition, SERI has established a program to deal specifically with the use of renewable energy resources in developing countries. Technical development, planning, information compilation, and institution building are fundamental parts of the effort. As a research institute, SERI, in particular, wants to ensure that adequate attention is given to the technical problems associated with the use of renewables in developing countries. These problems are too often not recognized as being worthy of scientific attention, resulting in the design and installation of less than optimal equipment. The limited resources available require optimal allocation and intelligent application. In addition, SERI manages bilateral assistance programs with developing countries under the auspices of the US Department of Energy and the US Agency for International Development. 15 references.

30 DIRECT ENERGY CONVERSION

3001 Mhd Generators

18774 **(ANL-IVTAN-JT—4) US/USSR cooperative program in open-cycle MHD electrical power generation: joint test report No. 4. Tests in the U-25B facility: MHD generator tests No. 6 and 7.** Picologlou, B.F.; Batenin, V.M. (Argonne National Lab., IL (USA)). Jan 1981. Contract W-31-109-ENG-38. 240p. NTIS, PC A11/MF A01.

A description of the main results obtained during Tests No. 6 and 7 at the U-25B Facility using the new channel No. 2 is presented. The purpose of these tests was to operate the MHD generator at its design parameters. Described here are new plasma diagnostic devices: a traversing dual electrical probe for determining distribution of electron concentrations, and a traversing probe that includes a pitot tube for measuring total and static pressure, and a light detector for measuring plasma luminescence. Data are presented on heat flux distribution along the channel, the first data of this type obtained for an MHD facility of such size. Results are given of experimental studies of plasma characteristics, gasdynamic, thermal, and electrical MHD channel performance, and temporal and spatial nonuniformities. Typical modes of operation are analyzed by means of local electrical analyses. Computer models are used to obtain predictions for both localized and overall generator characteristics. These theoretical predictions agree closely with the results of the local analyses, as well as with measurements of the overall gasdynamic and electrical characteristics of the generator.

18775 **Solar-powered liquid-metal MHD power systems.** Pierson, E.S.; Branover, H.; Frabis, G.; Reed, C.B. (Argonne Natl Lab, IL). *Mechanical Engineering ;* **102**: No. 10, 32-37(Oct 1980).

Coupling two-phase liquid-metal MHD power cycles to solar collectors has the potential for higher efficiency in converting solar energy to useful electrical power output at any collector temperature. The MHD interaction is a volume effect, so that efficiency is essentially independent of design power level down to fractional-megawatt size. The use of two working fluids in the energy-conversion system is advantageous in coupling the conversion cycle to solar collectors, and direct-contact boilers can be used to obtain higher conversion system temperatures. Liquid-metal MHD conversion systems appropriate to low, intermediate, and high collector temperatures are described, along with initial efficiency results. 14 refs.

18776 High-power MHD system combustor development testing. Swallom, D.W.; Sonju, O.K.; Burry, R.V.; Cooper, R.F. (Maxwell Lab Inc, Woburn, Mass). *Journal of Energy ;* **4**: No. 3, 100-105(May-Jun 1980).

This paper describes some of the technical accomplishments of the most recently completed phase of a multiphase program to design, construct, and test a lightweight, high-power prototype portable MHD generator system. The main objective of this phase was to demonstrate the feasibility of hot-gas flow train components of high-performance, lightweight design. Significant advances in terms of such parameters as combustor heat release density, combustion efficiency, channel power density, and energy extraction rates were made. The combustion system has a high-performance, 160-element injector, and the channel was constructed using lightweight electrode frames and a high-strength, lightweight glass-fiber-wound composite outer wall structure. 8 refs.

18777 Description of the DOE Coal-Fired MHD Flow Facility (CFFF). Dicks, J.B.; Martin, J.F.; Muehlhauser, J.W.; Strom, S.S. (Univ of Tenn, Tullahoma). pp 81-85 of IEEE Region 6 conference. Piscataway, NJ; IEEE (1980).

From IEEE Region 6 conference; San Diego, CA, USA (20 Feb 1980).

Over the past several years, investigations of direct coal-fired magnetohydrodynamics (MHD) power generation have been carried out at the University of Tennessee Space Institute (UTSI). The overall objective of this facility is to advance the technology of direct coal-fired MHD components and systems required for MHD power systems operating under simulated central power station conditions.

18778 Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980). 445p. (CONF-800617—(Vol.1)).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

Separate entries were made in the data base for 59 of the 61 papers included. Two of the papers were previously entered in the data base and can be located in the report number index under number CONF-800617. (WHK)

18779 Experimental investigation of vibrational characteristics of elements of U-25 facility test train. Granovsky, E.A.; Dreizin, L.Z.; Kovbasyuk, V.I.; Korolev, C.V.; Minyaev, N.A.; Pashkov, S.A.; Pinkhasik, M.C. (Inst. of High Temperatures, Moscow, USSR). pp 21-30 of Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

Results of an investigation of pressure fluctuations of combustion products and vibrations of structural elements of the high-temperature flow train of the U-25 Facility are described. The effects of combustion modes in the combustor, the loading of the MHD generator channel, and the diffuser flow characteristics upon pressure fluctuations and structural vibrations have been determined. Presence of high frequency vibrations of the nozzle and the diffuser has been established, their sources located, and means for their elimination have been proposed.

18780 First results of the United States/Netherlands Joint Program in closed cycle MHD. Sluyter, M.M. (Dept. of Energy, Washington, DC); Liccardi, A.L.; Sacks, S. pp 31-39 of Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

The United States Department of Energy (DOE) and The Netherlands Energy Research Foundation (ECN) have recently signed an Agreement in the Field of Magnetohydrodynamic Power Generation. This has resulted in the establishment by DOE and ECN of a Joint Program in Closed Cycle Magnetohydrodynamics (CCMHD). The overall objective of this program is to advance the understanding of the CCMHD process. The specifics of the Joint Program are described, including the historical background of the Agreement, the planned test program and the status of the current work. The Joint Program involves testing a US supplied CCMHD generator utilizing the 5 MWt Blowdown Facility located at the Technische Hogeschool-Eindhoven (THE), The Netherlands. It also involves data exchange for the several different Netherlands MHD generators that will be designed and tested by THE for ECN. The first THE MHD generator, which is a heat sink design, has already performed successfully in an initial series of cold and hot flow aerodynamic and thermal checkout experiments. This MHD generator will be utilized in MHD power experiments planned for mid-1980 after the completion of the Eindhoven facility installation and checkout of a cryogenic magnet. A US MHD generator, which is scheduled for testing in mid 1981, has been designed for DOE by the General Electric Company. This generator has been designed to accommodate preheat so that inner wall material temperatures can be obtained approaching those that would result from long duration, steady-state operation with a near-adiabatic generator design. A detailed discussion is given of the General Electric design for the preheated MHD generator and for the associated preheat equipment which will be installed in the Eindhoven facility.

18781 Component Development and Integration Facility (CDIF) progress update. Lightner, R.G. (Dept. of Energy, Washington, DC); Dooley, M.T. pp 40-46 of Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

The Component Development and Integration Facility (CDIF) project was initiated in 1975 to provide a testing facility for MHD power train components at a scale suitable for the acquiring of engineering data in support of the US MHD development program. Today, construction is nearly complete and the emphasis of work has shifted to the installation and check-out of the first test train. The current status of the CDIF and the MHD development program which is planned at the facility are reported. A brief background on the origins and purposes of the facility is provided, its initial capabilites and the existing test plan are outlined, and the physical progress being made and the possible future role of the facility are discussed.

18782 Controllability and malfunction analysis of MHD/CDIF Test Train 1A. Hanson, J.P.; Black, D.L.; Hofer, D.A. (Westinghouse Advanced Energy Systems Div., Pittsburgh, PA). pp 47-51 of Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

The Magnetohydrodynamic (MHD) Component Development and Integration Facility (CDIF) lcated in Butte, Montana will serve as a test facility for long duration testing of reduced scale versions of components for eventual use in an MHD topping cycle for a coal fired electric power plant. The first development tests, scheduled for late 1980, will be performed with components collectively labeled Test Train 1A (TT1A). The three objectives of this study are: 1) development of a nonlinear transient hybrid computer model of TT1A components and control loops; 2) examination of the effectiveness of the process controls available for regulation of the normal operation of the test train including startup and shutdown; and 3) examination of the effects of malfunction transients on the operation of the test train with the objective of establishing criteria for normal and emergency operating procedures, and for the operation of automatic shutdown devices. A hybrid (analog/digital) computer was selected as the basic tool on which to implement an analytic representation of TT1A. Model development is described. (WHK)

18783 Results of the experiments from the 4MW/sub th/ coal fired MHD test facility. Brzozowski, W.S.; Kozlowski, T.; Rybacki, Z.; Adamus, A.; Licki, J. (Inst. of Nuclear Research, Swierk, Poland). pp 79-87 of Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

The experimental results from the tests carried out during the 1979 period in the 5MW/sub th/ coal fired MHD test facility in Swierk, Poland, are described. The new item which has recently been added to the stand, namely the vitiated air heater, is briefly described and its characteristics are discussed. The results of investigations of optimal seed injection method and the influence of coal powder particle sizing on combustor behaviour and performances are also included. The temperature of the combustion gases is measured both from the absolute intensity of the self-reversed potassium line and by the intermittent checking of the contour of the same line. The interaction of slag laden combustion gases with channel walls and electrodes is also described and methods of electrical measurements are discussed.

18784 Recent experimental results from tests of the UTSI coal-fired MHD generator. Scott, M.H.; Altstatt, M.C.; Wu, Y.C.L.; Holt, W.L.; Dicks, J.B. Jr.; Galanga, F.L.; Clemons, R.W. (Univ. of Tennessee Space Inst., Tullahoma). pp 88-94 of Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

Recent experimental results obtained in generator testing under high slagging conditions are reported. Local behavior at the electrode interfaces is shown to be a strong function of current leakage. The effect of increased leakage is characterized by frequency signatures for parameters measured which become weighted more heavily in the region of high frequency (> 1 KHz) as compared to the low frequency end (> 200 Hz) which reflects bulk plasma characteristics. Further, impoved local voltage distribution can be obtained by loading redistribution.

18785 STD/MHD codes: comparison of analyses with experiments. Vetter, A.A.; Maxwell, C.D.; Demetriades, S.T. (STD Research Corp., Arcadia, CA). pp 110-117 of Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

The STD Research MHDQ3D code was applied to simulate experimental tests of the Avco Mark VI-C and the UTSI DCW MHD power generating channels. The simulations were analyzed and the results are compared to experimental data. The agreements of the experimental and theoretical values for the Mark VI-C runs 111, 112, and 114 are well within the tolerance of the measurements. These results, although accurate and meaningful within the limits of the computations, are not all-inclusive, but represent an important step toward complete simulation and understanding of MHD channel test data.

18786 Liquid-metal MHD for solar and coal. Pierson, E.S.; Cohen, D.; Grammel, S.J. (Argonne National Lab., IL). pp 150-157 of Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

The two-phase-gernator, liquid-metal magneto-hydrodynamic (LMMHD) energy conversion system has as inherently higher thermodynamic efficiency for the same heat source and sink temperatures and is better suited for cogeneration than other conversion systems. For solar applications, attractive efficiencies in comparison with alternative systems are calculated at ~ 580 K and ~ 1090 K, and cogeneration advantages are indicated. For coal applications, recent coal combustion gas-copper reaction results show that the copper can be used to control SO_2 emissions. The calculated cycle efficiencies are comparable to those for open-cycle plasma MHD at combustor temperatures of 2220 K or less.

18787 Study of solar heat exchanger: closed cycle pulsed MHD systems. Negrini, F.; Gentilini, M.; Montanari, I. (Bologna Univ., Italy). pp 171-177 of Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

The exchanger-accumulator of a solar heated closed-cycle pulsed MHD system must provide the He + Cs mixture with the amount of heat required to bring it to 2000 K and then accelerate it into a MHD channel. A preliminary determination was made for a plant with 1 MW/sub e/ power and 5- second pulse duration after three hours of insolation. Theoretically, the accumulator should behave as a source of heat at T = costant for the mixture. In practice, the mass of the matrix of the spheres (tungsten or alumina), the exchange area and the size of the spheres were calculated based on suitable hypotheses. Alumina in the form of small bulbbles was used for thermal insulation. The heating process was studied with the aid of a parametric analysis, i.e. by assessing the influence of various factors on time required to heat the accumulator and on maximum temperature reached at the focus of the solar-energy concentration system. Also, the possibility was studied of using a selective-transparency coating on the aperture of the optical cavity enclosing the exchanger. As a result, optimal thermal power intervals were identified, thus determining the size of the optical system according to the specifications chosen.

18788 Analyses of the power take-off regions of the U-25 bypass and the US U-25 channels. Pan, Y.C.; Doss, E.D. (Argonne National Lab., IL). pp 178-186 of Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

A power take-off model has been developed for analysis of various loading schemes for a diagonally-connected MHD channel with single or multiple outputs. The model is applicable for power take-off connections with diodes only or with diodes and ballast resistors. This model is coupled to a quasi-three-dimensional MHD channel model. The power take-off analytical model is used to analyze the electrical loading of the U-25 bypass and the U-25 channels. The predictions of the current and electric field distributions in the power take-off regions of the U-25 bypass channel are compared with the experimental data, and very good correlations are found. The effects of shifting the power take-off region on the current, the electric field, and the power output are also discussed. The distributions of current and potential are obtained for the power take-off regions of the U-25 channel, which is originally designed to be connected to diodes only. The effects of including the nozzle and the diffuser as part of the front and the rear power take-off regions are discussed. The option of using ballast resistors to even out the current is also considered.

18789 Heat transfer scaling laws for MHD channels and diffusers. Ahluwalia, R.K.; Im, K.H. (Argonne National Lab., IL). pp 187-194 of Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

A quasi-three-dimensional flow model is used to study the convective and radiative heat transfer characteristics of coal-fired MHD channels and diffusers. The radiative contributions of carbon dioxide, water vapor, potassium atoms, and slag particles are all included in the model. The scale-up of heat transfer with the size of MHD channels and diffusers is characterized as an aid to extrapolation of experimental heat transfer measurements. The scale-up of radiation with the channel or diffuser size, centerline temperature, wall temperature, boundary layer thickness gas pressures, and aver-

age size and number density of slag particles is investigated. Generalized plots of gas emissivity and absorptivity are provided for use in estimating radiative heat transfer in MHD channels and diffusers.

18790 **Fabrication of the U-25 MHD generator.** Kuczen, K.D. (Argonne National Lab., IL); Killpatrick, D.; Pereira, A.J.; Leavens, W.M.; Clark, R.; Turner, A. pp 195-201 of Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

As part of the US/USSR Cooperative Program in development of MHD electrical power generation, an MHD generator was designed and fabricated in the United States' for testing in the Soviet U-25 MHD pilot plant. The generator consists of a nozzle, channel, and diffuser/steam generator adapter. Argonne National Laboratory (ANL) was responsible for overall project management and system engineering of the project. The generator was designed by Modern Electric Power Products and Service Company (MEPPSCO); the nozzle and channel were fabricated by Westinghouse Advanced Energy Systems Division, and the diffuser/steam generator adapter was fabricated by Boeing - all under contract to ANL. Fabrication of the generator is described and the special manufacturing, inspection, and testing techniques developed during the course of manufacture are discussed. Problems that can arise during fabrication of first-of-a-kind components are exemplified. Manufacturing operations are described, including coextrusion of platinum-clad copper bar, and the fabrication of electrode caps from this material. Use of a computer graphics method for checking final machining data is explained, and a process combining chemical milling and electron beam welding, which was developed to minimize distortion, is emphasized.

18791 **Electrical conductivity mechanisms in iron-containing slags.** Hosler, W.R.; White, G.S.; Negas, T. (National Bureau of Standards, Washington, DC). pp 220-225 of Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

Understanding the electrical conductivity of coal slags of various compositions and the effect of current transport on the underlying materials at conditions found in an MHD generator channel is essential to the success of a generating power system. A unique method for determining the electrical conductivity of coal slag has been developed which eliminates the errors usually encountered due to surface oxidation or reduction and slag creep over the sides of the boat or slag container. Slag conductivities at high temperatures (above 1400°C) are independent of oxygen pressure and of seed content up to amounts likely to be incorporated in the slag in an operating channel. The lack of O_2 pressure dependence of the conductivity implies that the iron ion charge ratio is also not a dominant factor in the conductivity magnitude at high temperature. The Fe^{+2}/Fe^{+3} ratio in Bow, NH slag has been determined by wet chemistry methods after the slag was treated at a series of temperatures and quenched to room temperature. Equilibration times at these temperature have been determined. As expected, the iron ion ratio (i.e. the charge state of the iron in slag) is a function of temperature in air. It appears that the movement of iron ions is the primary factor in the high temperature conductivity due mostly to the higher inherent charge and small size of the iron ions in comparison with potassium. At lower temperatures, where the slag is no longer liquid, the conductivity depends on the crystalline state of the component materials.

18792 **Electrical conduction studies in slag.** Pollina, R.; Anderson, W.F.; Larsen, R. (Montana State Univ., Bozeman). pp 226-232 of Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

Some final results of a project to study the electrical characteristics of a Rosebud coal slag as it relates to the operation of an MHD generator are presented. These include the electrical conductivity of Rosebud coal slag seeded with potassium carbonate from 700 to 1450°C, and from 0.5 to thirty weight-percent equivalent K_2O seed concentration in the slag; channel calculations, including the conductivity in the Faraday direction, the slag layer leakage resistance, and the voltage drops and electric field gradients in the layer; estimates of slag polarization effects; and thermionic emission experiments.

18793 **Activity coefficients in seeded coal slag and their effects on vaporization and crystallization equilibria.** Byker, H.J.; Craig, R.E.R.; Eliezer, I.; Eliezer, N.; Howald, R.A.; Viswanadham, P.; Woodriff, R. (Montana State Univ., Bozeman). pp 240-247 of Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

Potassium vapor pressures over four component synthetic seeded slag samples have been measured by a diffusion technique in Woodriff furnaces. These data have been used along with thermodynamic and equilibrium values from the literature to construct a mathematical model for activity coefficients in the four component system $KO_{.5}$-CaO-$A1O_{1.5}$-SiO_2. The mathematical model uses the extended Redlich-Kister notation of Howald and Eliezer. A new computer program has been written, incorporating this model. This permits calculations of vaporization and crystallization equilibria within the four component system, which is a moderately accurate model for the behavior of actual seeded slags. Calculated potassium vapor pressures are compared to measurements on synthetic four-component samples, and to measurements on actual seeded slags of known composition. The drastic effect of calcium oxide content on $KO_{.5}$ solubility in slag is documented. Calculations on the equilibrium vaporization of slag in a slag rejecting combustor are shown for several typical compositions, and compared with similar calculations from Aerodyne and Argonne National Laboratory. The adequacy of approximations based upon ideality of mixing in silicates is evaluated. It is shown that calcium vaporization is not well-described by ideal models including CaO as a component. Calculations are presented on the crystallization of anorthite from seeded slag layers under channel conditions, and the effect of this crystallization on observed electrical conductivities is discussed.

18794 **Interelectrode insulator performance under an applied axial field.** Hermina, W.; Kruger, C.H. (Stanford Univ., CA). pp 248-253 of Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

Experiments have been run in the Stanford M-2 facility with clean fuels to tests the performance of three new insulator design under an applied axial field. The results indicate improved insulator performance, relative to a normal MgO test insulator, for two of three new designs.

18795 **Electrochemistry of slagging MHD electrodes.** Cadoff, L.H.; Rossing, B.R. (Westinghouse Research and Development Center, Pittsburgh, PA). pp 254-261 of Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

Experimental and theoretical aspects of electrochemical corrosion of MHD electrodes in coal slags are reviewed. The role of slag chemistry, temperature, electrode material and conduction mechanisms of slags and electrodes on corrosion is described. It is concluded that electrochemical reactions can be minimized by modifying slag properties (i.e., increasing fluidity, increasing electrical and electronic conductivity) and/or by judiciously selecting materials whose electrical conductivity and conduction mechanisms match that of the slag.

18796 **Electrode development at Avco Everett Research Laboratory, Inc.** Hruby, V.J.; Morenski, J.; Petty, S.W.; Solbes, A. (Avco Everett Research Lab., Inc., MA). pp 262-269 of Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

Experimental results of recent electrode tests performed under representative open cycle MHD conditions in the AERL Mk VI and Mk VII facilities are reported. Emphasis is placed on discussion of results of anode design and materials showing the greatest potential to withstand the harshness of slagging MHD channel environment. Five separate tests were performed with plasma sulfur concentration equal to or greater than that resulting from combustion of reference Illinois # 6 and Montana Rosebud coal in air. The total number of accumulated power hours in these tests in 163. A number of electrode designs and materials have been tested. These were copper, selected precious metals and various specialty stainless and nickel steels. The results indicate that gas exposed copper anodic surfaces cannot be tolerated and in addition to platinum stainless steels such as EB 26-1 appear to be good candidates for anodic protection. The corrosion rates of copper and selected stainless steel anodes are reported.

18797 **Experimental investigation of the effects of electrode wall temperature on MHD channel performance and cathode nonuniformities.** Hruby, V.J. (Avco Everett Research Lab., Inc., MA). pp 270-277 of Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

A set of three experiments were performed in a slagging combustion-driven MHD generator to investigate the effects of average electrode wall temperature on: 1) the development and behavior of cathode nonuniformities, and 2) the channel performance, as reflected by the generator power, Hall field stand-off, electrode voltage drop and heat flux. Two Mk VII channels with two sets of electrode walls and identical sidewalls were used. One set of electrode walls was designed to operate at a temperature of about 400°F and the other at a temperature of about 2200°F. It was found that: 1) under identical flow and ash feed rate conditions, the hot cathode wall experienced a lower degree of cathode nonuniformities than its cold counterpart, 2) without ash injection, the hot wall channel performed considerably better than the cold wall channel, and 3) with ash injection the performance of the two channels was comparable. The experimental hardware and operating conditions are described. The design of the hot electrodes is described in detail. Then the generated power, Hall voltages and heat flux of the two channels is compared, followed by comparison of voltage drops. Finally, the cathode nonuniformities are discussed, followed by the salient conclusions.

18798 **Hafnia-rare earth oxides for high temperature MHD electrodes.** Marchant, D.D.; Bates, J.L. (Battelle-Pacific Northwest Lab., Richland, WA). pp 287-291 of Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

Hafnia-rare earth oxide electrodes and hafnia-rare earth oxides-indium oxide current leadouts are being developed for use in hot wall MHD channels. The electrode materials are highly resistance to slag/seed attack and electrochemical corrosion. The electrodes are thermodynamically stable over the several orders of magnitude of oyxgen partial pressures that may be encountered during operation in an MHD generator. The current leadouts have high electrical conductivity to low temperatures and are thermomechanically and electrochemically compatible with the refractory electrodes. The electrode and current leadout materials can be combined into single composites with a refractory electrochemical corrosion resistant surface and adequate electrical conductivity to temperatures as low as 400K. Developed fabrication methods produce high density, uniform microstructure composites. Several laboratory tests confirm the positive features of the electrode and current leadout materials.

18799 **Development of a steam plant for a coal-fired MHD power plant.** Kulesza, P.R.; Owens, S.; Kolbe, R.L. (Univ. of Tennessee Space Inst., Tullahoma). pp 322-328 of Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

The University of Tennessee Space Institute (UTSI) under DOE sponsorship is developing a coal-fired magnetohydrodynamic (MHD) process which after development, will be used for commercial power production. The gas leaving the MHD topping cycle is about 2450°K and contains combustibles. The considerable thermal and calorific value of the gas will be used in a steam bottoming cycle. Development of this cycle is necessary because the gas temperature and composition (reducing with slag and potassium) differ from existing commercial practice. At USTI a radiant slagging furnace and secondary combustor will be installed in the Coal-Fired Flow Facility (CFFF) to simulate power plant equipment. Major developmental and design features of these components are reviewed and some of the background information used in arriving at the design for these components is presented.

18800 **Heat transfer scaling laws for MHD radiant boilers.** Im, K.H.; Ahluwalia, R.K. (Argonne National Lab., IL). pp 329-336 of Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

A combined convection-gas radiation, two-zone flow model is formulated for study of the heat transfer characteristics of MHD radiant boilers. The radiative contributions of carbon dioxide, water vapor, potassium atoms, and slag particles are included in the formulation. The model is used to analyze the scale-up of heat transfer in radiant boilers with refractory thickness, wall emissivity, and boiler size, under conditions of a gas composition and slag particle spectrum typical of coalfired MHD combuston. A design procedure is suggested for sizing radiant boilers so as to achieve required heat extraction rate and to provide a flow residence time that is adequate for decomposition of NO/sub x/ to acceptable levels.

18801 **Heat recovery and seed recovery development project for coal-fired open-cycle MHD power plants.** Ziobrowski, A.J. (Babcock & Wilcox Co., Barberton, OH); Wenderoth, F.H.; Tram, S.V.; Cusumano, J.P.; Cosgrove, E.J.; Novack, M.E. pp 337-343 of Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

To advance the development of a commercial magnetohydrodynamics (MHD) power generation system, priority must be given to the Heat Recovery/Seed Recovery (HRSR) system. The results of work carried out by The Babcock & Wilcox Company (B & W) under contract with the United States Department of Energy (DOE) to develop a technological base for the design of HRSR subsystems and components for coal-fired, open-cycle MHD power plants are discussed. One of the early tasks of the program included the design of a conceptual 300 MW HRSR and the evaluation of the technical risks associated with its development. These risks are being used as input to the design of a smaller unit which will be tested as part of the project. The development of the 300 MWt HRSR Conceptual Design is described. The design basis and the overall cycle are examined. A description of the main components of the HRSR is given, including a discussion of the technical risks and design rationale for each component.

18802 **NO/sub x/ decomposition and heat transfer in the diffuser of an open-cycle MHD system.** Sistino, A.J. (Argonne National Lab., IL). pp 363-369 of Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

Control of the NO/sub x/ pollutant associated with an open-cycle MHD system is a problem that has received much attention. One of the methods proposed for elimination of this problem is to burn the fuel, particularly coal, at a substoichiometric ratio in the primary combustor and to decompose the NO/sub x/ in the radiant boiler downstream. By maintaining certain temperature levels and gradients, and residence times in the radiant boiler, the amount of NO/sub x/ released to the atmosphere can be reduced to the permissible level. Decomposition of NO/sub x/ in the diffuser is studied; because the formation or decomposition is strongly influenced by temperature levels and gradients, heat transfer in the diffuser is also studied. A mathematical model of the NO/sub x/ chemical mechanism is formulated and coupled to fluid flow and heat transfer models. In particular, twenty-nine chemical reactions are devised, which comprise a composite of prior NO/sub x/ models, with added chemical equations and up-to-date kinetic constants. The chemical species are kinetically solved. One-dimensional equations for conservation of mass, momentum, and energy are included. In the momentum equation, a friction term is formulated for simulation of the experimental pressure recovery factor. A model of the convective and radiative heat transfer is included in the energy equation.

18803 **Direct coal fired wet bottom ceramic regenerative heat exchanger for closed cycle MHD.** Omori, S. (General Electric Co., King of Prussia, PA); Fleming, E.S.; Cook, C.S.; White, L.R. pp 379-384 of Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

Design concepts, test facilities and operational advantages of a directly coal fired ceramic regenerative heat exchanger system are described. The heat exchanger is fired by a regeneratively air cooled cyclone coal combustor and has a high temperature bottom support structure allowing slag drainage. The test facility has been developed under the GE closed cycle MHD program to simulate operation of argon blowdown and combustion gas reheat modes at up to 4 atm. However, the high temperature bottom support construction also has application to the directly fired air preheaters ultimately desired for the highest efficiency open cycle MHD configuration and this work is integrated with the development of that component, as well. Tests have been designed to simulate full scale, programmed, and cyclic operations of the combustor/heat exchanger facility and will include measurements of NO/sub x/ emission levels as a function of the catalytic effects of alumina core bricks, as well as the effects of flue gas recirculation. The heat exchanger system is two-staged with a high temperature heat exchanger and a preheater. The high temperature heat exchanger, which is a highly insulated hot bottom heat exchanger, has a 14 inch diameter brick matrix with 1/2 inch diameter flues. This heat exchanger has been designed to operate with a top core brick temperature of approximately 3000°F, with a bottom brick temperature in the range of 1400 to 2100°F and to permit off-line clean-out of accumulated slag by continuous heating to 2500°F. The preheater functions to preheat a working fluid, argon or air, up to 1500°F as well as to cool the combustion products before entering the stack.

18804 **Inverter system development for MHD applications.** Ray, E.R. (Westinghouse Electric Corp., Pittsburgh, PA); Schainker, R. pp 421-425 of Seventh international conference on MHD electrical power generation. Dawson, A.M.; Overlan, D. (eds.). Cambridge, MA; Massachusetts Institute of Technology (1980).

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

Interfacing MHD Electrical Power Plants with the established electric utility grid depends upon the ability to efficiently and reliably convert dc current to conventional ac. Inherent in the dc-to-ac inversion process are limitations which necessitate a careful evaluation of tradeoffs to produce the most cost effective, reliable and efficient system. The Westinghouse development of an inverter system for operation with a diagonally-loaded MHD generator at the Component Development and Integration Facility (CDIF) at Butte, Montana is discussed. The trade offs, of various converter technologies are discussed, and specific aspects of the design development, based upon the use of static power conditioning equipment to provide a complete dc-to-ac conversion system are considered. It has the capability of operating at maximum ratings of 10 kW dc, 600 amps and 3.5 MW steady state. The dc-to-ac conversion system design and interfaces between both the MHD channel and the ac grid network of Montana Power Co. (MPC) are discussed.

18805 **First--generation open-cycle MHD power plant.** Lowenstein, A.; Zygielbaum, P. (EPRI, Palo Alto, CA). *Proceedings of the American Power Conference ;* **41**: 518-527(23 Apr 1979). (CONF-790443—).

From American power conference; Chicago, IL, USA (23 Apr 1979).

The strategy for MHD development described in the paper emphasizes the incorporation of more conventional technologies in key subsystems in order to provide attractive plant reliability, while offering modest efficiency incentives and competitive economics. This paper describes technical and economic objectives and promising design concepts for these first-generation MHD power plants. The state of development of critical subsystems in the projected first-generation plants is also reviewed. 14 refs.

3003 Thermoelectric Generators

REFER ALSO TO CITATION(S) 18538, 18538

18806 **Thermoelectric energy conversion: economical electric power from low grade heat.** Benson, D.K.; Jayadev, T.S. (Sol Energy Res Inst, Golden, CO). pp 27-56 of Proceedings of the third international conference on thermoelectric energy conversion. Rao, K.R. Piscataway, NJ; IEEE (1980).

From 3. international conference on thermoelectric energy conversion; Arlington, TX, USA (12 Mar 1980).

Resources of low grade thermal energy which are presently wasted or underutilized can be turned into sources of economical electric power by the use of thermoelectric energy converters. Thermoelectric power generation is based on a bulk, solid-state phenomenon which directly converts a heat flux to electric current in a semiconductor device. This paper describes these potential applications of thermoelectric energy conversion, their predicted performance and their economics. 25 refs.

3004 Thermionic Converters

REFER ALSO TO CITATION(S) 18538, 18538

18807 **(DOE/NASA/1062—7) High power densities from high-temperature material interactions.** Morris, J.F. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1981. Contract AI01-77ET13111. 22p. (NASA-TM—81626; CONF-810614—1). NTIS, PC A02/MF A01.

From 16. thermophysics conference; Palo Alto, CA, USA (23 Jun 1981).

Thermionic energy conversion (TEC) and metallic-fluid heat pipes (MFHPs) offer important and unique advantages in terrestrial and space energy processing. And they are well suited to serve together synergistically. TEC and MFHPs operate through working-fluid vaporization, condensation cycles that accept great thermal power densities at high temperatures. TEC and MFHPs have apparently simple, isolated performance mechanisms that are somewhat similar. And they also have obviously difficult, complected material problems that again are somewhat similar. Intensive investigation reveals that aspects of their operating cycles and material problems tend to merge: high-temperature material effects deter-

mine the level and lifetime of performance. Simplified equations verify the preceding statement for TEC and MFHPs. Material properties and interactions exert primary influences on operational effectiveness. And thermophysicochemical stabilities dictate operating temperatures which regulate the thermoemissive currents of TEC and the vaporization flow rates of MFHPs. Major high-temperature material problems of TEC and MFHPs have been solved. These solutions lead to productive, cost-effective applications of current TEC and MFHPs - and point to significant improvements with anticipated technological gains.

3005 Fuel Cells

REFER ALSO TO CITATION(S) 18933

18808 (BNL—51319) Fuel-cell applied research: electrocatalysis and materials. Quarterly report, January 1-March 31, 1980. Srinivasan, S.; Isaacs, H.S.; McBreen, J.; O'Grady, W.E.; Olender, H.; Olmer, L.J.; Schouler, E.J.L.; Kordesch, K.V. (Brookhaven National Lab., Upton, NY (USA)). Sep 1980. Contract AC02-76CH00016. 28p. NTIS, PC A03/MF A01.

Research on phosphoric acid-electrolyte fuel cells and high-temperature solid-electrolyte fuel cells is reported. The corrosion behavior of five Cabot Corporation furnace black carbon supports for platinum electrocatalysts in phosphoric acid was evaluated using a cyclic voltammetric technique. The electrode kinetic studies of the hydrogen oxidation and the oxygen reduction reactions on smooth platinum in phosphoric acid, previously used as the electrolyte in an Energy Research Corporation fuel cell, revealed that the entire decrease in performance of a fuel cell in this impure electrolyte, as compared with fresh phosphoric acid at operating temperatures above 160°C, is entirely due to the impurity. A mathematical model which describes the slow oxygen adsorption step was compared with the experimental polarization and impedance results of uncontaminated platinum electrodes in contact with yttria-stabilized-zirconia electrolytes. Attempts to explain discrepancies were made by assuming that the adsorption of oxygen followed a Langmuir and then a Frumkin adsorption isotherm. It was concluded that a site variation occurred on the electrode surface when potentials were varied in the cathodic region. Investigations of gold electrodes in reducing environments have shown that the polarization behavior is similar to that of platinum. The direct relationship between the limiting current for H_2 oxidation and P/sub H2O/P/sub H2/ indicates the presence of a slow chemical step involving H_2. (WHK)

18809 (DOE/MC/08450—T2) Soot control for fuel-cell anodes: task No. 16. Final topical report, July 1, 1980-September 30, 1980. Ham, D.; Lewis, P.; Lord, G.; Pugh, E. (Physical Sciences, Inc., Woburn, MA (USA)). Dec 1980. Contract AM21-78MC08450. 41p. (TR—243). NTIS, PC A03/MF A01.

Experimental results are reported for conditions in which soot forms on stainless steel surfaces under conditions relevant to operation of a molten carbonate fuel cell power plant. Results were obtained in two different experimental configurations. It is shown that all soot was formed on a catalytic surface and not in the gas phase. Soot formation was found to be rapid for dry gas mixtures which occur between a cold gas clean-up region and a fuel cell in proposed power plant designs. Equilibrium calculations are presented which show that, over certain temperature ranges, partial equilibrium might lead to more soot than full equilibrium among the gas components.

18810 (DOE/SF/10538—T8(Vol.2), pp 247-271) **Fuel cells.** Mar 1981. NTIS, PC A08/MF A01.

In Studies on advanced overseas energy technologies. Volume II. Final report.

An assessment of the status of fuel cell technologies in Switzerland, France, Spain, Belgium, and Japan is given. (WHK)

18811 (EPRI-EM—1730) Advanced-technology fuel-cell program. Final report. Bett, J.A.S.; Bushnell, C.A.; Buswell, R.F. (United Technologies Corp., South Windsor, CT (USA)). Mar 1981. 237p. NTIS, PC A11/MF A01.

The results of a nine-year effort to develop an advanced fuel cell technology are summarized. The various programs involved and details of the development of molten carbonate fuel cells, advanced phosphoric acid fuel cells, increased liquid fuels and coal fuel capabilities, and power conditioning systems are described.

18812 (EPRI-EM—1730-SY) Advanced-technology fuel-cell program. Summary report. Bett, J.A.S.; Bushnell, C.A.; Buswell, R.F. (United Technologies Corp., South Windsor, CT (USA)). Mar 1981. 39p. NTIS, PC A03/MF A01.

An executive summary outlining a nine-year effort to develop an advanced fuel cell technology is presented. Descriptions of fuel cell power plants used for utility application, the suitability of initial power plant technology, molten carbonate and advanced phosphoric acid fuel cells, an improved fuel capability, and power conditioning investigations are summarized.

18813 Alternate synthesis of electrolyte matrix for molten carbonate fuel cells. Arendt, R.H.; Curran, M.J. (GE, Schenectady, NY). *Journal of the Electrochemical Society ;* **127**: No. 8, 1660-1663(Aug 1980).

A process is presented for the preparation of the electrolyte matrix, a poorly bonded assemblage of $LiAlO_2$ crystallites, based on the use of a fugitive reaction medium, a molten mixture of alkali chlorides. Data on the characteristics of both the reaction and the product are presented. 8 refs.

18814 Alternate fabrication process for molten carbonate fuel cell electrolyte structures. Arendt, R.H.; Curran, M.J. (GE, Schenectady, NY). *Journal of the Electrochemical Society ;* **127**: No. 8, 1663-1666(Aug 1980).

A process is presented for the preparation of reinforced molten carbonate fuel cell electrolyte structures which does not involve a hot-pressing operation. This process is based on the use of an electrolyte-free $LiAlO_2$ matrix material of predetermined, tailored characteristics. The matrix is fabricated into a "blank" using conventional ceramic techniques. The "blank" is subsequently infiltrated under controlled conditions with molten electrolyte. 3 refs.

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

REFER ALSO TO CITATION(S) 18772

18815 Lighting issues in the 1980's. Rubin, A.I. (ed.). Washington, DC; Department of Commerce (1980). 174p. (CONF-7906210—). GPO.

From Conference on lighting issues in the 1980's; New York, NY, USA (14 Jun 1979).

The Lighting Roundtable described in this report was conducted to foster an open discussion of the goals, issues, and responsibilities of the lighting community. It was not a problem-solving session, but rather a time to examine the long-term aspirations and objectives of lighting and the barriers that may stand in the way of achieving them. Eight major issues were addressed by nine panelists and a number of invited auditors. The issues are as follows: (1) The Public Image of the Lighting Community; (2) US Role in the Worldwide Lighting Community; (3) Factors Affecting Human Activities in the Built Environment; (4) Effect of Lighting on Environmental Quality; (5) Effects of Barriers; (6) Establishment of Illuminance Levels; (7) Integration of Subsystems; and (8) Professional Development and Lighting Education. Two parts presented are: (1) a summary of the proceedings; and (2) a complete transcript.

3201 Buildings

REFER ALSO TO CITATION(S) 18032, 18153, 18253, 18343, 18349, 18365, 18369, 18377, 18420, 18711, 18714, 18715, 18716, 18717, 18718, 18722, 18854, 18854, 18881, 18899

18816 (ANL/CNSV-TM—58) Energy and materials use in the production and recycling of consumer-goods packaging. Gaines, L.L. (Argonne National Lab., IL (USA)). Feb 1981. Contract W-31-109-ENG-38. 32p. NTIS, PC A03/MF A01.

A comparison is made of the energy consumed annually in the United States to produce paper, glass, steel, aluminum, and plastic for consumer-goods packaging and types of energy used for production are examined. Energy saved through recycling and combustion for energy recovery also is considered. A maximum of 1.5 quad could be saved if this packaging material were recycled, and about 0.6 quad could be recovered if it were burned as part of municipal solid waste. Paper and plastic compete in several markets, including bags and milk containers: in almost all cases, the plastic container requires less energy to produce and recycle. However, the major energy input to paper manufacture is wood, rather than oil and natural gas. Glass bottles require less energy to produce than aluminum or steel cans. On the other hand, aluminum cans take less energy to recycle than bottles, and recycled aluminum cans are the least energy intensive of the single-serving beverage containers, except for refillable glass bottles that are reused several times. For family-sized beverage bottles, a plastic bottle uses less energy to make and to recycle than a glass bottle. In addition, plastic bottles are combustible. However, glass bottles could be made with no oil or natural gas input, and they can be reused.

18817 **(BNL—29221) Economics of cogeneration in commercial buildings.** Martorella, J. (Brookhaven National Lab., Upton, NY (USA). National Center for Analysis of Energy Systems). 1981. Contract AC02-76CH00016. 25p. (CONF-810443—1). NTIS, PC A02/MF A01.

From NYU cogeneration conference; New York, NY, USA (6 Apr 1981).

A method of analyzing the economic feasibility of utility interconnected cogeneration facilities in commercial buildings is presented. Some general rules of thumb for the designers of these systems and a detailed understanding of the complex interactions between variables such as building type, cogeneration plant size, thermal loads, electric loads, and electric rate structures are given. A modified version of the DOE-2 Building Energy Analysis Model was employed to simulate the energy flows within the apartment and office buildings studied. The cogeneration technology simulated in all cases was a generic type, consisting of medium-speed diesel-generator sets with heat recovery from exhaust, jacket water, and lubricating oil. For each building type five system sizes were evaluated and Appendix A gives the installed cogeneration capacity and other plant parameters for all 10 cases. Different rate types (declining block rate, time of day, etc.) were used in the analysis so that any economic perturbations due to rate type would be observed; actual rates used appear in Appendix B. Cost assumption data appear in Appendix C. (MCW)

18818 (CONF-800483—(Vol.1), pp 251-257) **Optimizing the mass flow and temperature difference in a cooling system for energy conservation.** Hart, M.N.; Bond, S.K. (Energy Engineering Associates, Inc., Austin, TX). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Conventional wisdom in recent times has been to raise the chilled-water temperature to conserve chiller power. This is an effective and well-proven conservation strategy: however, it may be less optimal than other available alternatives. Reducing the fan speed and therefore the amount of circulating air in most cases is more energy efficient than raising the chilled-water temperature. Either alternative is viable only if the system was originally overdesigned or the refrigeration load has been reduced by alterations such as reduced illumination. The removal of energy from a space or product is typically the function of a mass flow times a temperature difference. To reduce the rate of heat removal, either the mass flow rate or temperature difference can be diminished. In most applications, greater energy savings are associated with reducing the mass flow rate. This is the result of the inefficiency associated with fans and pumps compared with the relatively good efficiency (COP) of a chiller. An optimization strategy is developed for specifying the mass rate and temperature difference for given heat loads to minimize energy consumption.

18819 (CONF-800483—(Vol.1), pp 258-262) **Industrial HVAC air-to-air energy-recovery retrofit economics.** Graham, E.L. (Energy Recovery Co., Germantown, WI). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Retrofitting air-to-air energy recovery equipment is relatively simple to design and easy to install. Additionally, HVAC energy recovery is almost risk-free when compared to process retrofit. Life-cycle cost analysis is the best way to illustrate the economic attractiveness of retrofitting HVAC industrial energy-recovery equipment.

18820 (CONF-800483—(Vol.1), pp 263-267) **Plant-wide energy conservation program yields impressive results.** Adikes, R.P.. (Teledyne Continental Motors, Muskegon, MI); Zupko, A.J.; Adams, J.W. 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

In September of 1977, an in-depth survey of energy use was begun at the Industrial Products Division with the specific objective of recommending cost-effective means of reducing energy costs to augment Teledyne's ongoing conservation efforts. Boiler operations, steam distribution and condensate return systems, heating and air-conditioning systems, building shell, and other available opportunities for energy-usage reduction were evaluated. By a series of process changes, HVAC revisions, and other cost-effective conservation measures, Teledyne has reduced energy consumption by 380,000 MBtu per year, a decrease of 65% based upon 1974 consumption. Energy savings coupled with reduced associated fixed costs are equivalent to a total cost avoidance of over $1,200,000. The results of the energy survey and system designs, Teledyne's progressive implementation of energy conservation techniques, and actual plant performance to date in achieving energy savings are given.

18821 (CONF-800483—(Vol.1), pp 422-435) **Cost-energy dynamics of thermal insulation: potential energy savings and policy recommendations.** Phung, D.L. (Oak Ridge Associated Universities, TN); Plaza, H. 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Extra insulation for saving energy from the viewpoint of a decision maker is addressed. Public and private decisions are distinguished. Profitability and process analyses are combined to obtain a simple trade-off relationship between the extra cost and extra energy saving. Due to higher costs of energy at present and in the foreseeable future, good opportunities exist to retrofit existing thermal envelopes with extra insulation. Potential costs and savings in the residential, commercial, and manufacturing sectors are assessed. A hypothetical $10 billion insulation budget is determined to save 0.5 quad/y of energy for the next 10 to 15 years, resulting in conservation energy costing less than $2/MMBtu. IT is argued that public subsidies to energy conservation and energy supply technologies should be weighed so that the worth of each unit of resultant energy at the point of use is the same.

18822 **(CONF-800966—) Proceedings of the conference on waste heat recovery for energy conservation: residential and light commercial heat pumps, air conditioning, and refrigeration systems.** Hawks, K.H.; Evans, R.J.; Walukas, D.J. (eds.). (Purdue Univ., Lafayette, IN (USA). School of Mechanical Engineering; Oak Ridge National Lab., TN (USA)). 1980. Contract W-7405-ENG-26. 192p. NTIS, PC A09/MF A01.

From Conference on waste heat recovery for energy conservation: residential and light commercial heat pumps; West Lafayette, IN, USA (15 Sep 1980).

Separate abstracts are prepared for 21 presentations delivered at the conference. One paper appeared previously in the appropriate DOE Energy Data Bases. (MCW)

18823 (CONF-800966—, pp 139) **Federal incentives (RCS program).** Fiskum, R. (Dept. of Energy, Washington, DC). 1980. NTIS, PC A09/MF A01.

From Conference on waste heat recovery for energy conservation: residential and light commercial heat pumps; West Lafayette, IN, USA (15 Sep 1980).

Programs that the government has set up to help get energy conserving devices and services installed in buildings are briefly discussed. The programs are the Residential Conservation Service; the Conservation Tax Credit; the Weatherization Assistance Program; the Solar Conservation Bank; a low cost assistance program managed by the Human Resources Service Department with money allocated to states who meet specific qualifications for these funds; and development of the building energy performance standards. (MCW)

18824 (CONF-7910212—) Energy efficient housing: a prairie approach. (Saskatchewan Univ., Saskatoon (Canada). Dept. of Mechanical Engineering). Oct 1980. 35p. NTIS (US Sales Only), PC A03/MF A01.

From Conference on passive solar housing; Saskatoon, Saskatchewan, Canada (13 Oct 1979).

Some practical measures that allow conserving energy in houses are discussed. Ideas based on the Saskatchewan Conservation House are incorporated. Conservation measures discussed for new houses are air tightness, insulation, use of windows for lighting, and insulating window systems. Refitting an older house is discussed. Water heating conserving measures and energy conservation in electricity usage are detailed. Some sources of information on house construction, plans for energy conserving houses, shutters, general construction, and solar heating are listed. (MCW)

18825 (DOE/CE—0003) Energy-efficient hospitals: DOE-assisted retrofit projects. (USDOE Assistant Secretary for Conservation and Renewable Energy, Washington, DC). Apr 1981. 31p. TIC.

Features of energy conservation programs at hospitals to improve energy efficiency are described. The DOE Institutional Conservation Program provides matching grants to hospitals and other public institutions to develop, implement, and manage projects to improve energy efficiency within their facilities. Information on DOE grants awarded to the hospitals, measures implemented by the hospitals for energy recovery and energy conservation, savings accomplished, project costs, estimated annual savings, and approximate payback period are discussed for the following hospitals: Saint Joseph, Towson, Maryland; Bronson Methodist, Kalamazoo, Michigan; Albany General Hospital, Albany, Oregon; Saint Vincent's Medical Center, Jacksonville, Florida; DePaul Community Health Center, Bridgeton, Missouri; Woodland Memorial Hospital, Woodland, California. (MCW)

18826 (DOE/CS/20076—T1) Occupancy-counter-based control system. Final report. Schultz, G.; Hoagland, L.C.; Bowman, J.K. (Advanced Mechanical Technology, Inc., Newton, MA (USA)). Jul 1979. Contract AC02-77CS20076. 139p. NTIS, PC A07/MF A01.

Excessive mechanical ventilation of commercial and institutional buildings can result in significant waste of energy required for space heating and cooling. Ventilation rates are typically set to satisfy building design occupancy levels, in accordance with local codes, even though the building may seldom or never experience design occupancy. A method of eliminating this waste to utilize an occupancy-based ventilation control system wherein a counting device records people entering and leaving the building, to maintain a continuous record of people inventory, and to regulate mechanical ventilation control dampers to supply only that amount of ventilation air required for current occupancy levels is described. A device of this type was installed and tested in a department store in Framingham, Massachusetts and fully instrumented and operated over a 14 month period. Test results on energy usage were correlated with weather severity in order to determine the savings resulting from use of the control system. This system provided a savings of 33% in gas usage during the winter period and a savings of 23% in electricity usage during the summer period. These savings would return the installed cost of the control system in about 1 1/2 years. Projections of the performance of this system in other climatic regions (Chicago, Los Angeles, Kansas City, Miami, Minneapolis) are also presented illustrating payback periods ranging from 1/3 year in Miami to 2 2/3 years in Los Angeles. Complete details of the occupancy based ventilation control system, the test site instrumentation and data gathering procedure, the test results and their interpretation are given. (MCW)

18827 (DOE/CS/30254—3) Continuing development of the DEROB system. Quarterly report, January 1, 1981-March 31, 1981. Arumi-Noe, F. (Texas Univ., Austin (USA). School of Architecture). Mar 1981. Contract AC02-80CS30254. 71p. NTIS, PC A04/MF A01.

More accurate and efficient algorithms to calculate geometric factors and obstruction logic was developed, programmed, and tested. These new algorithms were needed in order to facilitate the incorporation of lighting, both natural and artificial, into the DEROB System. With this new set of algorithms it will be possible to hard-wire, with minimum user involvement, the highly desirable capability of calculating light propagation via light shafts, courtyards and other multispace radiation coupling problems. This capability will include as a special case, the simple one room illumination analysis. The report contains the basic theory for these algorithms, and the listing of the DRBGF module that has them incorporated. The completed incorporation of diffuse lighting into DEROB is expected to be completed by September 1981.

18828 (DOE/R5/10227—1) Solarization/conservation technology development program for existing housing. Progress report. Oberdick, W. (Michigan Univ., Ann Arbor (USA). Architectural Research Lab.). 1 Feb 1981. Contract FG02-80R510227. 14p. NTIS, PC A02/MF A01.

A four month period of project organization, data file examination, development of concepts and technical study of S/C components is covered. At the start of the project 188 residences were considered appropriate for study in this program. All of these houses in the course of three years have had code update assistance. This has included some conservation retrofit. The City of Ann Arbor has been selected for a pilot study of the RCS Audit program. As of this date an initial 200 audits have been completed. Also, the C D office is presently undertaking the conservation retrofit of several residences in accordance with RCS recommendations. Available aerial photographs have proved to be inadequate for solar-site evaluation. The conservation updates and the RCS audits present an opportunity for evaluation and comparisons.

18829 (DOE/SF/01910—T1) Home Energy Saver's Handbook. Final report. Koga, N.N. (ed.). (Hawaii Community Design Center, Honolulu (USA)). Sep 1980. Contract FG03-78SF01910. 43p. NTIS, PC A03/MF A01.

Energy is described and how much energy a household consumes is discussed. Starting to save energy now is recommended and measures to save energy when operating hot water heaters, air conditioners, lighting systems refrigerators, freezers, stoves, microwave ovens, washing machines, clothes dryers, dishwashers, television sets, and portable appliances are summarized. (MCW)

18830 (DOE/SF/01937—T1) Wood-fired cogeneration system for University of California, Santa Cruz. Final report. Stayton, R. (Energy Action, Santa Cruz, CA (USA)). 1979. Contract FG03-78SF01937. 125p. NTIS, PC A06/MF A01.

An innovative design of wood-fired cogeneration to meet the needs on the campus at the University of California is described. It is an open-cycle, indirectly-fired gas turbine with heat recovery in the exhaust stack. There is in addition an auxiliary system turbine to make use of the heat not required in the summer months. The system incorporates a fluidized bed combustor to achieve high combustion efficiency and low overall pollution. The system can be assembled from readily available components. The system will deliver a net efficiency of 83%, with 28% of the wood energy being converted to electricity and 55% being converted to recovered heat. It will provide 2.4 Megawatts of electricity and 5.3 MW (18 million Btu per hour) of heat for buildings and hot water. The main environmental constraints are air quality and noise, and it appears that this system can be fitted to the prevailing standards.

18831 (DOE/SF/01983—T1) Home Energy Management Devices. Final report. Ross, J.W.; Bower, S.; McMillan, B.B. (Ross (James W.), Scottsdale, AZ (USA); Bower (Sid), Las Vegas, NV (USA); McMillan and Associates, San Francisco, CA (USA)). Nov 1980. Contract FG03-78ET10731; FG03-78SF01931; FG03-78SF01983. 76p. (DOE/SF/01931—T1; DOE/ET/10731—T1). NTIS, PC A05/MF A01.

Summaries of three programs of the Appropriate Energy Technology Program in Region IX are given for varied home energy management devices. They are: Concept Testing of an Electrical Peak Demand Controller for Residential Loads; Power Consumption Cost Indicator; and A Study of the Feasibility of an Energy Conserving Microcomputer-Based Thermostat. (MCW)

18832 **(EUR—6848-FR) Heat pump operating with a mixture of fluids. Final report.** Rojey, A.; Meyer, C.; Choffe, B.; Jacq, J.; Asselineau, L.; Vidal, J. (Institut Francais du Petrole (IFP), 92 - Rueil-Malmaison). 1980. 147p. (In French). NTIS (US Sales Only), PC A07/MF A01.

The coefficient of performance of a heat pump system comprising an external heat exchange medium may be increased if a non-azeotropic mixture of hydrocarbons or freons as working fluid is used so that it vaporizes or condenses with a change in temperature of the external fluid, i.e., the heat exchange medium. The aim of the research project was the selection of suitable mixtures and the investigation of their properties, the study of the operation of a heat pump using such mixtures by means of a mathematical model and experimental tests, as well as by a technico-economic analysis of actual applications in domestic heating systems and in the industrial sector. The study of the operation of the heat pump confirmed that significant gains in consumption of up to 50% could be obtained in certain cases. The technico-economic case analysis confirmed the proposed solution in respect of energy consumption and economics. A heat pump must, therefore, be designed for continuous operation under defined conditions and subjected to practical tests for a sufficiently long period.

18833 **(LBL—11793) Performance of residential air-to-air heat exchangers: test methods and results.** Fisk, W.J.; Roseme, G.D.; Hollowell, C.D. (Lawrence Berkeley Lab., CA (USA)). Sep 1980. Contract W-7405-ENG-48. 84p. NTIS, PC A05/MF A01.

Test results obtained on five different residential heat exchangers are presented and the performance criteria, the test facility, and the test procedures used are described. The performance parameters measured were heat exchanger effectiveness (a measure of heat transfer ability), airstream static pressure drop, net cross-stream leakage, and fan system performance. Results showed the ability to transfer heat ranged from 43% to 75% of the theoretical maximum. The resistance to air flow varied by a factor of two. One of the heat exchangers was highly susceptible to leakage between airstreams and one had an unstable performance. Future plans are indicated: additional heat exchangers will be tested, a new test system will be used to measure cross-stream leakage, and the possibility and consequences of freeze-up within the heat exchangers will be investigated.

18834 **(LBL—12049) Radiative cooling test facility and performance evaluation of 4-MIL aluminized polyvinyl fluoride and white-paint surfaces.** Kruskopf, M.S.; Berdahl, P.; Martin, M.; Sakkal, F.; Sobolewski, M. (Lawrence Berkeley Lab., CA (USA)). Nov 1980. Contract W-7405-ENG-48. 67p. NTIS, PC A04/MF A01.

A test facility designed to measure the amount of radiative cooling a specific material or assembly of materials will produce when exposed to the sky is described. Emphasis is placed upon assemblies which are specifically designed to produce radiative cooling and which therefore offer promise for the reduction of temperatures and/or humidities in occupied spaces. The hardware and software used to operate the facility are documented and the results of the first comprehensive experiments are presented. A microcomputer-based control/data acquisition system was employed to study the performance of two prototype radiator surfaces: 4-mil aluminized polyvinyl fluoride (PVF) and white painted surfaces set below polyethylene windscreens. The cooling rates for materials tested were determined and can be approximated by an equation (given). A computer model developed to simulate the cooling process is presented. (MCW)

18835 **(LBL—12189) Impact of energy-conserving retrofits on indoor air quality in residental housing.** Berk, J.V.; Young, R.A.; Brown, S.R.; Hollowell, C.D. (Lawrence Berkeley Lab., CA (USA)). Jan 1981. Contract W-7405-ENG-48. 27p. (CONF-810631—1). NTIS, PC A03/MF A01.

From 74. annual meeting of the Air Pollution Control Association; Philadelphia, PA, USA (21 Jun 1981).

The impact of energy-conservation retrofits on the indoor air quality of residential buildings is being assessed through a field-monitoring project in which air leakage, air exchange rates, and indoor air pollutants are measured before and after retrofit measures are implemented. A mobile laboratory was used to make detailed on-site measurements of air exchange rate and concentrations of radon, formaldehyde, total aldehydes, particulates, carbon dioxide, carbon monoxide, nitrogen dioxide, nitric oxide, ozone, and sulfur dioxide in two houses and effective leakage area measurements were made in seven others. Results from the nine houses studied here show that the impact of energy-conserving retrofits depends on (1) the type and extent of the retrofit, (2) the operating characteristics of the heating/cooling system, and (3) the activities of the occupants.

18836 **(NYU/DAS—78-25) Experimental investigation of fuel vaporization on combustion efficiency.** Zakkay, V.; Agnone, A.; Brenner, W.; Kennedy, M. (New York Univ., Westbury, NY (USA). Antonio Ferri Labs.). Jan 1979. Contract AC22-77ET11283. 104p. NTIS, PC A06/MF A01.

The effects of vaporized and premixed fuel oil combustion on the efficiency of home oil burners is being investigated experimentally. A comparison of this combustion method to present burners that utilize spray combustion of atomized fuel oil is also made. In contrast to the oil vaporization scheme used in commercial oil burners and other oil vaporization schemes previously considered, such as the developmental work conducted by the American Petroleum Institute on a Prototype vaporized oil burner in the late 1960's, the present investigation emphasizes the premixed aspects of the combustion schemes to achieve improved efficiency and clean burning. In Phase I of this research, the status, advantages and problems encountered with a vaporization burner for No. 2 oil are discussed. Evaporation and combustion characteristics of four vaporization schemes have been evaluated from experimental data gathered with a laboratory set-up for each. The salient experimental data is summarized in order to permit a selection of one of these schemes for adaptation in an actual oil burner. An experimental apparatus for measuring the thermal efficiency of the adapted vaporization scheme and for operational development of the vaporized schemes has been set up and instrumented. In view of the potential energy saving benefits derivable from a vaporized combustion scheme, it is recommended that the adaptation and operational development be realized in Phase II of this research.

18837 **(P—400-80-065) Nonresidential energy efficiency in California: achieving a 20% improvement by 1985. Volume I. Executive summary and action plan; Volume II. Technical report.** Clinton, J.; Chiu, V.; MacCurdy, D. (California Energy Commission, Sacramento (USA)). Mar 1980. 118p. California Energy Commission, Sacramento, CA.

Progress by utilities in preparing to comply with the load management standards adopted by the California Energy Commission is discussed. Interviews were conducted to gain qualified data on energy efficiency, but were limited to existing commercial-industrial facilities and operations. A synopsis of the key findings and conclusions is presented in the summary document (Volume I). Detailed findings and analyses are presented in the Technical Report (Volume II). Technical appendices include a tabulation of the customer and energy consultant interviews, program evaluation criteria, sample audit checklists, and proposed eligibility criteria for investment tax credits. (MCW)

18838 **(P—400-80-066) Guide to energy budgets. Division two. Energy conservation standards for new non-residential buildings.** (California Energy Commission, Sacramento (USA)). Sep 1980. 146p. California Energy Commission, Sacramento, CA.

Three options available to a builder to secure a building permit for a nonresidential building are: (1) The Component Per-

formance Standard, (2) The Nondepletable Energy Exemption, and (3) The Energy Budget Performance Standard; these are briefly described. The Guide deals specifically with Option Three, the Energy Budget Performance Standard. The option provides design flexibility and encourages development of the most energy conserving building designs possible within the constraints of the project. A Certified Energy Analysis Computer Program is utilized to determine the building's annual energy consumption. Information is presented on how to determine the total allowable energy budget. The purposes of Forms 13 and 14 are described and their formats are shown. Instructions on what to do if the building design does not comply are given. (MCW)

18839 **(P—400-81-001) California plan for the residential conservation service.** (California Energy Commission, Sacramento (USA)). Jan 1981. 71p. California Energy Commission, Sacramento, CA.

The background and objectives of the Residential Conservation Program are discussed. It is noted that the Federal program allows and encourages states to expand the RCS program to fit the needs of the states. Preparations and implementation of the California Plan are discussed. Benefits and services and conservation and renewable measures and practices stated in the California Plan are detailed. Responsibilities placed on utilities, government agencies, and conservation and renewable resource industries are described. Nineteen utilities participating in the Plan are listed. Additional information is provided on energy audits; arranging installation and financing; complaint procedures; qualifications of auditors, inspectors, installers, and mediators; utility financing, accounting, and billing; coordination; monitoring and enforcement; recordkeeping and reporting. (MCW)

18840 **(P—400-81-002) Regulations for the California tax credit. These regulations apply to conservation measures installed during 1981.** (California Energy Commission, Sacramento (USA)). Jan 1981. 13p. California Energy Commission, Sacramento, CA.

Tax credits applicable to energy conservation measures in California are described. How it works, who can take it, and how to apply are discussed. Common conservation measures for residential and nonresidential buildings are listed. Then two additional lists separating residential conservation measures and nonresidential measures are given. The text of the Conservation Tax Credit Regulations California Administrative Code, Title 20, Chapter 2, Subchapter 8, Article 1 (adopted December 17, 1980 and effective January 1, 1981) is given. (MCW)

18841 **(SAI—444-80-606-LJ) Consumer-products minimum-energy-efficiency standards program. Monthly progress report, 1 October-31 October 1980.** (Science Applications, Inc., La Jolla, CA (USA)). 10 Nov 1980. Contract AC03-79CS10757. 37p. NTIS, PC A03/MF A01.

An outline is presented of the major tasks and subtasks performed by SAI to provide technical support for the program. The work plan, development of energy efficiency data base, computer model development, field and laboratory test data, analysis of industry-wide energy efficiency data base, technical support to econometric models, rulemaking for minimum energy efficiency standards; technical consultation related to minimum energy efficiency standards; evaluation of foreign appliances energy efficiency test procedures, standards, and selected products are briefly discussed. The selected products include: dishwashers, television sets, clothes washers, humidifiers, dehumidifiers, and heat pumps. Energy consumption data have been reviewed for the oven product class for Germany, UK, and Italy and physical characteristics data for a large number of products are tabulated. Measuring procedures are noted. US oven test procedures require a different means of measuring energy consumption, but six domestic models have been tested in a similar manner to the European procedures and those data are tabulated and compared with foreign products. Technical progress, meetings, and briefings are reported. (MCW)

18842 **(SERI/TP—722-1169) Impacts of the Residential Conservation Service program on residential solar developments.** Potter, T.; Bircher, T. (Solar Energy Research Inst., Golden, CO (USA)). Apr 1981. Contract AC02-77CH00178. 6p. (CONF-810509—16). NTIS, PC A02/MF A01.

From Annual conference of the International Solar Energy Society; Philadelphia, PA, USA (26 May 1981).

The roles of the various participants in the Residential Conservation Service (RCS) program are examined, with special attention to their potential influence on the program's effectiveness in accelerating solar commercialization. Cooperation and support of the participants will be necessary for the information and implementation assistance goals of the program to be achieved, but resistance and obstructions are noted.

18843 **Effect of retrofits on combustion characteristics and seasonal efficiency of gas-fired furnaces and boilers.** Zawacki, T.S.; Macriss, R.A. Chicago, IL; Institute of Gas Technology (1981). 25p. (CONF-810101—8).

From American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) meeting; Chicago, IL, USA (25 Jan 1981).

Results are presented from a recently completed 3-yr field study designed to assess the energy conservation effectiveness of retrofitting central gas-fired space heating furnaces and boilers. This study, known by the acronym SHEIP (for Space Heating Efficiency Improvement Program) dealt with the development of appropriate procedures for the retrofitting, the acquisition, and analysis of field-test data from over 2650 test sites monitored by 67 participating gas companies from the 48 contiguous states and a province in Canada. Results for several groups of sites (similiarly retrofit-modified by a single, double or quadruple retrofit) are presented and show that the range of statistically significant gas savings, obtained varied between 0.5 and 13.2% for warm-air installations, and between 2.8 and 9.9% for hot-water boiler installations. For retrofit modifications that included gas input derating (with or without secondary air adjustment and with or without vent restrictor present in the vent system of the furnace), the gas savings obtained could simply but accurately be correlated with the change in steady-state efficiency, level of gas input derating, and vent-pipe area reduction. Also presented is an account of the test design, procedures for site selection, inspection, data acquisition and analysis, comparisons of quality of combustion, efficiency, and energy consumption characteristics of these installations between pre- and post-retrofit conditions.

18844 **Mathematical model and experimental validation of a rock bed regenerative cooler.** Mumma, S.A. (Arizona State Univ., Tempe); Rodriquez, J.M. *Proceedings of the Annual Meeting - American Section of the International Solar Energy Society ;* **3.1**: 220-223(1980). (CONF-800604—P2). Phoenix, AZ, USA (2 Jun 1980).

A study was made of the fuctional characteristics of a rock bed regenerative indirect evaporative cooling system (RBR). The study was divided into two portions: the first dealing with the experimental investigation of the thermodynamic behavior of the system and the second with the development of a mathematical model for simulating performance. Indirect evaporative cooling systems based on rock beds for heat exchange and/or storage are technically feasible for regions that do not require dehumidification of outdoor air for comfort. The mathematical model used for the simulation tracks the experimental data, thus providing the system designer with a valuable tool. The rock bed regenerative cooling system offers a viable alternative to the expensive air condition unit and to the comfort limited evaporative cooler for providing comforting conditions. It also offers an operating savings potential in both the electrical demand and consumption compared with mechanical refrigeration and, therefore, a cost savings under current electrical rates in the proposed new demand rate charges.

18845 **Consumer assessment of residential energy conserving innovation.** Ellison, M.H.B. Knoxville, TN; Univ. of Tennessee (1980). 380p. University Microfilms Order No. 81-04,584.

Thesis (Ph. D.).

The study consists of three parts: (1) a theoretical study in which writings from multi-disciplines were examined for their potential to make a contribution to the conservation of energy; (2) a methodological study to develop an instrument to evaluate consumer acceptance of energy conserving innovation, INOVAC; and (3) an experimental field study, in which an energy conservation education program was delivered to consumers and whereby they

were evaluated on the meanings they then attributed to energy conserving innovative window designs as a result of the education experience.

3202 Transportation

REFER ALSO TO CITATION(S) 18922, 18930, 18932, 18941

18846 (CONF-800483—(Vol.1), pp 100-105) **Development and testing of a flattened U-Tube heat exchanger.** Huebner, S.R. (Midland-Ross Corp., Toledo, OH). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

The development and testing of a U-Tube-type flue-gas energy-recovery system for fuel-fired industrial heat-treating furnaces are discussed. The flattened U-Tube configuration was selected since its relatively simple fabrication makes the unit quite cost effective. Development is described beginning with the formulation of a numerical-type mathematical model of the proposed heat exchange which was computerized and then used to perform a parameter study to optimize the unit design. Analysis of data, generated by laboratory testing of the final computer-selected design as a result of the computer study are presented. Comparison of the experimental data to the computer model is also demonstrated.

18847 **Energy use of electric vehicles.** Hamilton, W. (Gen Res Corp, Santa Barbara, Calif). *Transportation Research, Part A: General ;* **14A**: No. 5-6, 415-421(Oct-Dec 1980).

The object of the analysis discussed has been to be thorough and comprehensive, assuming levels of performance and technology for electric and conventional vehicles which are as nearly equal as possible. Published plans rather than hypothetical scenarios have been used in projecting the sources of the recharge energy which might be generated by U.S. electric utilities. 10 refs.

3203 Industry And Agriculture

REFER ALSO TO CITATION(S) 17954, 18535, 18718, 18735, 18737, 18806, 18818, 18820, 18821, 18832, 18910

18848 **(ANL/OEPM—80-9) Process engineering and economic evaluations of diaphragm and membrane chlorine cell technologies. Final report.** (Argonne National Lab., IL (USA)). Dec 1980. Contract W-31-109-ENG-38. 105p. NTIS, PC A06/MF A01.

The chlor-alkali manufacturing technologies of (1), diaphragm cells (2), current technology membrane cells (3), catalytic cathode membrane cells (4), oxygen-cathode membrane cells and to a lesser extent several other related emerging processes are studied. Comparisons have been made on the two bases of (1) conventional industrial economics, and (2) energy consumption. The current diaphragm cell may have a small economic advantage over the other technologies at the plant size of 544 metric T/D (600 T/D). The three membrane cells all consume less energy, with the oxygen-cathode cell being the lowest. The oxygen-cathode cell appears promising as a low energy chlor-alkali cell where there is no chemical market for hydrogen. Federal funding of the oxygen-cathode cell has been beneficial to the development of the technology, to electrochemical cell research, and may help maintain the US's position in the international chlor-alkali technology marketplace. Tax law changes inducing the installation of additional cells in existing plants would produce the quickest reduction in power consumption by the chlor-alkali industry. Alternative technologies such as the solid polymer electrolyte cell, the coupling of diaphragm cells with fuel cells and the dynamic gel diaphragm have a strong potential for reducing chloralkali industry power consumption. Adding up all the recent and expected improvements that have become cost-effective, the electrical energy required to produce a unit of chlorine by 1990 should be only 50% to 60% of that used in 1970. In the United States the majority of the market does not demand salt-free caustic. About 75% of the electrolytic caustic is produced in diaphragm cells and only a small part of that is purified. This study indicates that unless membrane cell costs are greatly reduced or a stronger demand develops for salt-free caustic, the diaphragm cells will remain competitive. (WHK)

18849 **(CONF-800483—(Vol.1)) Industrial energy conservation technology.** Schmidt, P.S.; Williams, M.A. (eds.). (Texas Industrial Commission, Austin (USA)). 1980. Contract FC01-75IR08141. 453p. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

A separate abstract was prepared for each of the 60 papers included in this volume, all of which will appear in Energy Research Abstracts (ERA); 21 were selected for Energy Abstracts for Policy Analysis (EAPA). (MCW)

18850 (CONF-800483—(Vol.1), pp 1-15) **Industrial wastes as a fuel.** Richardson, G.; Hendrix, W. (Georgia Inst. of Tech., Atlanta). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Physical and chemical data for determining the combustion characteristics and efficiencies for a wide variety of industrial wastes are presented. Wood and other cellulosic materials such as bagasse are discussed and then solid materials representing industrial waste are discussed. Case studies illustrating the economic advantages of conversion to firing of industrial wastes and efficient operations of these types of facilities are presented. Specific case studies covered are: cogeneration from wood residue at a lumber company; a wood-cardboard fired heating system; installation of a multiple fuel boiler at a carpet company.

18851 (CONF-800483—(Vol.1), pp 16-21) **Conversion of waste to energy.** John, T. (Tenneco, Inc., Houston, TX); Cheek, L. 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Almost every industrial operation produces some combustible waste, but conversion of this to useful energy is often more difficult than with other energy-recovery projects and requires careful attention to design, operating, and maintaining the facilities. Each application requires a careful approach tailored to the installation, but some general design and economic principles do exist. Several waste-to-energy projects are discussed to illustrate these principles.

18852 (CONF-800483—(Vol.1), pp 29-33) **Cogeneration/cogeneration: solid waste.** Pyle, F.B. (Glaus Pyle DeHaven Associates, Inc., Akron, OH). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

A review is presented of the rationale for cogeneration and basic turbine types available. Special considerations for cogeneration in conjunction with solid waste firing are outlined. Optimum throttle conditions for cogeneration are significantly different than normal practice for condensing units. The basic approach to cycle optimization is outlined with some typical examples offered.

18853 (CONF-800483—(Vol.1), pp 34-44) **Improving industrial-refrigeration-system efficiency: actual applications.** White, T.L. (Monsanto Co., St. Louis, MO). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Actual design and modifications for increased system efficiency are discussed. These include reduced chilled liquid flow during part-load operation, reduced condensing and increased evaporator temperatures for reduced-system head, thermosiphon-cycle cooling during winter operation, compressor intercooling, direct refrigeration vs brine cooling, insulation of cold piping to reduce heat gain, multiple-screw compressors for improved part-load operation, evaporative condensers for reduced system head and pumping energy, and using high-efficiency motors.

18854 (CONF-800483—(Vol.1), pp 45-55) **Computer control of refrigeration systems in a food-manufacturing plant.** Halaska, T.E. (Pet Inc., Eastman, GA). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Computer control of the cold rooms and freezers and of the environmental cooling (manufacturing plant and office air conditioning) has given Stuckeys in excess of 20% dollar savings in electricity. The specifics of the control system used and the results obtained are discussed.

18855 (CONF-800483—(Vol.1), pp 56-64) **Cooling towers, energy-conservation machines.** Burger, R. (Burger Associates, Dallas, TX). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Cooling towers, in all too many industrial plants, are often the neglected units of the process chain which are hidden bonanzas for energy conservation and dollar savings. By lowering the entire systems temperature by the use of colder water returning from the cooling tower, greater chemical-product volume can be condensed and less energy is required to run compressors. Two case histories and the rapid cost-effective savings thereby accruing through retrofit are discussed.

18856 (CONF-800483—(Vol.1), pp 65-71) **Waste-heat recovery from refrigeration in a meat-processing facility.** Murphy, W.T. (Armour and Co., Phoenix, AZ); Woods, B.E.; Gerdes, J.E. 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

A case study is reviewed on a heat-recovery system installed in a meat-processing facility to preheat water for the plant hot-water supply. The system utilizes waste superheat from the facility's 1350-ton ammonia-refrigeration system. The heat-recovery system consists of a shell-and-tube heat exchanger (16"0 x 14'0") installed in the compressor hot-gas-discharge line. Water is recirculated from a 23,000-gallon tempered-water storage tank to the heat exchanger by a circulating pump at the rate of 100 gallons per minute. All make-up water to the plant hot-water system is supplied from this tempered-water storage tank, maintained at a constant filled level. Tests to determine the actual rate of heat recovery were conducted from October 3, 1979 to October 12, 1979, disclosing an average usage of 147,000 gallons of hot water daily. These tests illustrated a varied heat recovery of from 0.5 to 1.0 million Btu per hour. The deviations were the result of both changing refrigeration demands and compressor operating modes. An average of 16 million Btu per day was realized, resulting in reduced boiler fuel costs of $30,000 annually, based on the present $.80 per gallon No. 2 fuel oil price. At the total installed cost of $79,000, including test instrumentation, the project was found to be economically viable. The study has demonstrated the technical and economic feasibility of refrigeration waste heat recovery as a positive energy conservation strategy which has broad applications in industry and commerce.

18857 (CONF-800483—(Vol.1), pp 72-78) **Billet heating with the homopolar generator.** Weldon, W.F. (Univ. of Texas, Austin); Keith, R.E.; Weldon, J.M. 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Forging billets are presently brought from room temperature to forging temperature using one of three heating methods - indirect heating in a furnace, either fuel-fired or electric; direct electric-resistance heating; or induction heating. Homopolar generators, operating in the pulsed mode, offer a fourth possible billet-heating method. Although basically a direct resistance-heating method, the homopolar-generator type of power supply has several advantages over a conventional transformer-type supply. First, homopolar generators can be designed to deliver energy at much higher power levels than transformers, resulting in very-much-shorter heating times than are required using conventional direct-resistance-heating systems. The shorter heating times minimize oxide scale formation on the billets. Second, pulsed homopolar generators, because they do not impose an increased load on the power mains during delivery of pulses, permit power averaging and minimize demand charges. When compared with slot furnaces, homopolar-generator billet-heating systems offer increased operating efficiency as well as the advantages of ease of maintenance and freedom from the necessity of maintaining temperature under no-load conditions in addition to the much-reduced scale formation.

18858 (CONF-800483—(Vol.1), pp 79-82) **Improved efficiency in ladle preheating: a case study.** Kiefer, J.R. (Cameron Iron Works, Inc., Houston, TX); Battles, D.D. 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

The history of the Advanced Technology Ladle Preheater program is discussed and a case study of the thermal efficiencies and economics of conventional ladle-preheating practices versus improved-ladle preheating practices is presented.

18859 (CONF-800483—(Vol.1), pp 83-91) **Use of aluminum process reject heat as the source of energy for a district-heating system.** McCabe, J. (Rocket Research Co., Redmond, WA); Olszewski, M. 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Rocket Research Company (RRC) is investigating the use of industrial process reject heat as a source of energy for large-scale district heating. The district-heating system is a network of closed-loop hot-water pipes that recovers energy from the fume-hood ducts at the Intalco aluminum-reduction plant and transmits the energy to commercial, residential, and institutional users in Bellingham, Washington for space and hot-water heating.

18860 (CONF-800483—(Vol.1), pp 92-99) **Analysis of the use of fluidized-bed heat exchangers for heat recovery.** Vogel, G.J.; Grogan, P.J. (Argonne National Lab., IL). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

The principles of fluidized-bed operation and the factors affecting the performance of a fluidized-bed waste-heat boiler (FBWHB) are discussed in detail. Factors included in the discussion are bed temperature and pressure, heat-transfer coefficient, gas properties, solids properties, and tube geometry. Qualitatively, no operating or technical difficulties are envisioned for employing fluidized-bed units in waste-heat-boiler applications. Fluidized-bed units generally require a minimum of operating attention and maintenance and the installation of an adequate control system. A general FBWHB design methodology is presented along with a preliminary engineering design for a space-heating application. A flowsheet and information on mass balance and equipment sizes are presented for a FBWHB system that would produce hot water by recovering part of the heat energy contained in a hot gas.

18861 (CONF-800483—(Vol.1), pp 106-112) **Evaluation of the energy-saving potential from flue-gas pressurization.** Stanton, E.H. (Inst. of Gas Technology, Chicago, IL). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

The potential for recovering energy from low-pressure-furnace flue products is limited when standard heat-recovery equipment is utilized. Efficient energy recovery can be accomplished by providing a flue-gas side-pressure drop across a heat exchanger placed in the path of the combustion gases. Practical methods of providing a driving force to accomplish this pressure drop are summarized, and optimization techniques for economical heat recovery are discussed.

18862 (CONF-800483—(Vol.1), pp 119-126) **Canada's voluntary industrial energy-conservation program.** Wolf, C.A. Jr. (Union Carbide Canada, Ltd., Toronto, Ontario). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Industrial energy conservation in Canada is organized and promoted through a voluntary program that is administered by industry. Industry is divided into fifteen sectors, each of which is represented by a voluntary task force. Information exchange, goal setting, and progress reporting are carried on through these task forces which are staffed with industrial volunteers and representa-

tives from the major trade associations. Inter-industry liaison is accomplished via a coordinating committee comprised of the individual task force chairmen and representatives of the Federal government. While the program has been in existence only since 1976, impressive gains have already been made and targets have been set for 1980 and 1985. The strength of the program lies in its candid cooperation between industry and government. There has, to date, been no need or advantage to implementing a government-mandated program for industrial energy conservation in Canada.

18863 (CONF-800483—(Vol.1), pp 127-139) **Overview of US Department of Energy program in industrial energy-conservation-technology development.** Massey, R.G. (Dept. of Energy, Washington, DC). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

The primary responsibility for Federal industrial energy conservation is in the Office of Industrial Programs which reports to the Assistant Secretary for Conservation and Solar Energy. The objectives of the Federal program are to: achieve maximum implementation of existing and new energy-conservation technologies; substitute, where possible, abundant fuels for scarce fuels; and minimize energy loss in waste streams. The basic strategy is cost-shared research, development, and demonstration leading to commercialization of energy-efficient technology. Considerations for project selection are: energy savings, acceleration of implementation, level of private effort, benefits to industry, cost-sharing, and degree of risk. Projected industry savings of the current program are 1.5 quads by 1985 and 5.5 quads by 2000.

18864 (CONF-800483—(Vol.1), pp 140-149) **French national energy-conservation program: the case of industry.** Zyss, J. (Dept. of Industry, Paris, France). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Since 1974, a new energy policy has been defined in France that emphasizes energy conservation, reduces vulnerability with respect to oil, and increases reliance on alternative sources of energy. The energy-saving potential in industry is indicated to be reduced by 30% on the basis of present technology. France has established a policy of very active involvement by government authorities to compel or incite consumers, especially those in industry, to save energy. In 1974, an Agency for Energy Conservation was created to implement the policy. Measures taken by the Agency with respect to the industrial sector are summarized. (MCW)

18865 (CONF-800483—(Vol.1), pp 150-155) **Role of the Canadian government in industrial energy conservation.** Godin, M.A. 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

By selecting the voluntary approach to deal with energy conservation, Canada has maintained the traditional cooperative relationship between government and industry and has been able to manage a successful energy-conservation program with a minimum of government intervention and bureaucracy. Industry sets the goals, identifies the opportunities to conserve energy, and reports on the improvements in energy efficiency. Government supports industry with a number of program elements designed to overcome the many barriers to energy efficiency that exist. The need for energy conservation, the role definition, and the barriers are discussed. (MCW)

18866 (CONF-800483—(Vol.1), pp 158-163) **Deere & Company energy-management program.** Boyd, P.M. (Deere & Co., Moline, IL). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

An overview of the Deere & Company energy-management program is discussed. Seven key elements that have contributed to the success of the program are reviewed. Installed projects and established programs are identified and discussed. The results achieved by Deere in energy conservation are quantified. Major points presented are audits, energy accounting, monitoring-program results, and feedback reporting. The corporate energy-management program is detailed. This includes organization, personnel requirements, energy-efficiency goals, and maintenance of a corporate data base.

18867 (CONF-800483—(Vol.1), pp 164-169) **Facing the energy dilema: one company's approach. Energy management at 3M at the plant level.** Marson, T.F. (3M Center, St. Paul, MN). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

The methods utilized to establish the State and National award-winning energy management programs at 3M are described. Also described is a systems-monitoring concept designed to predict, monitor, and control energy use in major buildings. The BSES (Building Specific Energy System) measures building cooling-heat demand, compares against specific building standards, and reports on a continuous basis.

18868 (CONF-800483—(Vol.1), pp 170-178) **Trends in Gulf Coast power supply, demand, and costs.** Posey, L.G. Jr. (Pace Co., Houston, TX). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

During the 1980s, both the cost and availability of electric power will become critical to corporations contemplating expansions and new sites along the Gulf Coast. Fuel costs have grown rapidly, and the shift to coal and nuclear power has sharply driven up capital outlays for new generating stations. Power costs have risen accordingly and will continue to do so for the foreseeable future. Furthermore, the rates of cost increases will vary widely among the utilities on the Gulf Coast so that their competitive positions will change significantly over the next ten years. Reserve margins will remain adequate for some utilities. Others, though, face periods of several years in which reserve margins could fall enough to threaten brownouts and service interruptions. The economic and environmental factors that will affect the growth of power demand are examined. Future trends in industrial power costs are also examined. The primary focus is on the industrialized areas of the Gulf Coast, but the paper also considers many general issues.

18869 (CONF-800483—(Vol.1), pp 179-183) **Evaluation of industrial energy options for cogeneration, waste-heat recovery, and alternative fuel utilization.** Hencey, S.; Hinkle, B.; Limaye, D.R. 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

The energy options available to Missouri industrial firms in the areas of cogeneration, waste-heat recovery, and coal and alternative-fuel utilization are described. The project identifies and evaluates technological options and describes the current status of various energy-resource-conservation technologies applicable to industry and the economic, institutional, and regulatory factors that could affect the implementation and use of these energy technologies. An industrial energy manual was prepared, identifying technologies with significant potential for application in a specific company or plant. Six site-specific industrial case studies were performed for industries considered suitable for cogeneration, waste-heat recovery, or alternative-fuel use. These case studies, selected after a formal screening process, evaluate actual plant conditions and economics for Missouri industrial establishments. It is hoped that these case studies will show, by example, some of the elements that make energy-resource-conservation technologies economically and technically feasible in the real world.

18870 (CONF-800483—(Vol.1), pp 184-193) **Cost-energy dynamics: an engineering-economic basis for industrial energy-conservation policies.** Phung, D.L. (Oak Ridge Associated Universities, TN); van Gool, W. 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

This paper develops a theory called cost-energy dynamics that can be used to shape policies for industrial energy conservation. It is built on two hypotheses commonly observed in process engineering; namely, cost varies as positive power function while energy varies as negative power function of the system size and/or complexity. These two hypotheses, which have roots in thermody-

namics, give rise to a technological parameter (denoted c) that can be determined for each unit process. Cost-energy dynamics ranks energy-conservation potentials of industrial processes by the technology parameter c, aggregates energy consumption by unit processes, considers energy embodied in the investment, considers the trade-offs between cost and energy, and distinguishes bases for decision making in the public and private sectors. Five unit processes are used to represent the US manufacturing industry. The aggregated technology parameter for industry is determined to be about 3.5. This value and the data on existing energy consumption allow the determination of energy-conservation potentials, extra capital-investment requirements, and the possible energy picture by the year 2000. Several public-policy tools are evaluated for their effectiveness in stimulating energy conservation.

18871 (CONF-800483—(Vol.1), pp 194-198) **Payback analysis of energy proposals.** Blevins, L.D.; Estes, C.B. (Oklahoma State Univ., Stillwater). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Payback analysis of investment proposals is one of the most widely used and often misapplied concepts in industry. Significant shortcomings are inherent to this method, its failure to consider the time value of money and inflationary factors being two. The problem of including the time value of money (to the firm) has been conquered by introducing the concept of discounted payback analysis. Recognizing the need of incorporating inflationary factors into economic analysis and the fact that the energy inflation rate often exceeds the inflation rate of the general economy, a technique is developed for including these parameters into payback analysis of energy investments. Included in the development of this method are examples of its correct and incorrect application with regard to energy (savings) related projects. Results are presented, indicating the analyst must be careful in the application of these parameters in calculating a proposal's payback, and in comparing energy related projects to non-energy related projects.

18872 (CONF-800483—(Vol.1), pp 201-214) **Energy conservation options in distillation processes.** Harris, G.E.; Hearn, W.R.; Blythe, G.M.; Stuart, J.M. (Radian Corp., Austin, TX). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

The results of a survey of energy conservation options applicable to distillation processes are summarized. Over twenty such options were identified, and eight were chosen for detailed description here. Options requiring moderate investment were increasing insulation, waste heat recovery, and tray retrofit; those requiring major capital investment were advanced instrumentation and control systems, heat pumping, intermediate reboilers and condensers, two-stage condensation, and split-tower operation. These options were chosen on the basis of good economics, applicability to retrofit situations, and/or the use of novel technology. (MCW)

18873 (CONF-800483—(Vol.1), pp 215-221) **Practical application of distillation-column energy-control systems.** Matthews, S.A. (Setpoint, Inc., Houston, TX). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Closed-loop computer control of an ethylene column has been shown to save $350/day in improved ethylene recovery and $150/day in reduced energy consumption. These savings are achieved through material-balance optimization and energy-balance optimization. How the material balance (hard target) and energy balance (soft target) control points are implemented is described. The following topics are covered: a brief review of distillation; a summary of distillation optimization; quality control (hard target); safety (soft target); and feed forward - interactive control. Both a general and a specific example are used. The specific example is an actual ethylene column.

18874 (CONF-800483—(Vol.1), pp 222-233) **Energy conservation possibilities using gas-separating membranes.** Knieriem, H. Jr.; Henis, J.M.S. (Monsanto Co., St. Louis, MO). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

The separation of gases using semipermeable membranes is a viable-unit operation. A novel composite membrane combined with hollow-fiber spinning technology enable Monsanto Company to offer PRISM Separators to the industrial market. The separator module accepts a mixed-gas stream and produces two enriched streams: one of which has concentrated the rapidly permeable gases and the second of which is enriched in the slowly permeable gases. Existing commercial installations have demonstrated energy and capital savings, ease of installation and operation, and functional reliability.

18875 (CONF-800483—(Vol.1), pp 234-236) **Making education and training impact on industry.** Cohen, K.C. (Massachusetts Inst. of Tech., Cambridge). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Factors or areas which impact on industrial training and education are explored. These include: motivation, industrial learning styles, cost, organizational climate, and accessibility. These factors may also be considered barriers if they stand in a person's way. An innovative system which deals effectively and appropriately with each of these factors in order to create more effective programs is described, namely: PROCEED (Program for Continuing Engineering Education). The program is composed of a personalized access system, an associated data base, and related educational materials which are competency based. (MCW)

18876 (CONF-800483—(Vol.1), pp 242-250) **Training for energy management: experience in one state.** Jacobs, I.M. (American Management Associations, Washington, DC). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

This paper examines the need for energy-management education in the industrial sector, and focuses on the cooperative efforts of Federal and state governments and educational organizations/institutions to fulfill that need. The roles of government and educational organizations and their respective capabilities in energy education are discussed, with emphasis on the role of the professional society. Two specific programs are described; the general workshop, designed to promote energy-conservation awareness and present fundamentals of establishing and managing a program in an industrial facility; and, in greater detail, the industry-specific workshop, in which the specific methods for applying energy-saving technology and management techniques to an industry's processes and equipment are presented in detail. The industry-specific workshop is discussed in the context of the effort of one state (New Jersey) to transfer these methods to private industry.

18877 (CONF-800483—(Vol.1), pp 273-278) **High-temperature heat-recovery systems using ceramic recuperators.** Young, S.B.; Bjerklie, J.W.; York, W.A. (Hague International, South Portland, ME). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Ceramic shell-and-tube recuperators capable of providing up to 1800°F preheated combustion air and operating at process-gas inlet temperatures of up to 2800°F have shown themselves to be cost-effective waste-heat-recovery devices. Full utilization of the heat recovered by such ceramic recuperators requires burners designed to accept combustion air preheated to recuperator design levels and economical high-temperature ducting. Energy savings, product development, and maintenance experience on installations in the steel-forging industry are discussed. Packaged furnace systems and non-forging applications of such recuperators are discussed.

18878 (CONF-800483—(Vol.1), pp 279-286) **Industrial waste heat recovery.** Ward, M.E. (Solar Turbines International, San Diego, CA); Solomon, N.G.; Tabb, E.S. 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Of 150 reports reviewed, the consensus was that the majority of recuperators used in the US are constructed of 300 and 400 series stainless steels which generally limit the recuperator temperatures to less than 1300°F. After reviewing the literature and from discussions with 12 recuperator manufacturers and research organizations, a general conclusion was that the upper material-temperature limit of 1500°F is state-of-the-art for recuperators operating in an oxidizing environment produced by the combustion of Diesel No. 2. A full-size counter-axial-flow metal heat-exchanger test module successfully completed 50 test hours with exit temperatures of 1650°F and firing temperatures of 2050°F. Performance monitored during the tests was well within predicted limits. Less than 5°F circumferential temperature gradients were measured in the axial-flow section of the test module. Also, reduction in thermal gradients across tube-to-header connection was achieved. Nine materials were tested in a 1700°F environment produced by the combustion of natural gas and Diesel No. 2 and also subjected to furnace oxidation tests. On the basis of these tests, promising heat-exchanger tube alloys were identified. Eighteen materials, coated and uncoated, were tested in a water-economizer environment below the acid-dewpoint temperature produced by the combustion of natural gas and Diesel No. 2. On the basis of these tests, promising low-temperature heat-exchanger tube alloys and coated surfaces were identified.

18879 (CONF-800483—(Vol.1), pp 287-300) **Cross-flow ceramic heat recuperator for industrial heat recovery.** Gonzalez, J.M. (GTE Products Corp., Towanda, PA); Cleveland, J.J.; Kohnken, K.H.; Rebello, W.J. 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

A joint venture between DOE and GTE Products Corporation was pursued to establish performance criteria and demonstrate a cross-flow ceramic heat recuperator for high-temperature industrial heat-recovery applications. The immediate goals of the ceramic-recuperator project are to demonstrate a heat exchanger capable of handling high temperatures (1600 to 2400°F), that is compact with a high surface area and with costs comparable to the lower temperature metal heat exchangers. The basic design is described and the design basis, the predicted recuperator performance, the ceramic and housing materials, the recuperator design procedure, and the fabrication and assembly are detailed. The data provided includes NTU-Effectiveness and flow friction and heat transfer (f and J) plots.

18880 (CONF-800483—(Vol.1), pp 301-308) **Estimation of fuel savings by recuperation of furnace exhausts to preheat combustion air.** Rebello, W.J. (PAR Enterprises Inc., Fairfax, VA); Kohnken, K.H.; Phipps, H.R. Jr. 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Installation of a recuperator in the furnace exhaust stream to preheat the combustion air can result in considerable savings in fuel usage. These savings are primarily the result of the sensible heat increase of the combustion air and, to some extent, improved combustion efficiency. The amount of fuel saved will depend on the exhaust gas temperature, amount of excess air used, the type of burner, and the furnace control system. These fuel savings may be accurately measured by metering the energy consumption per unit of production before and after installation of the recuperator. In the design of a waste-heat-recuperation system, it is necessary to be able to estimate the fuel saved by use of such a system. Standard industrial practice refers to the method described in the North American Combustion Handbook with its curves and tables that directly predict the percentage of fuel savings. The standard-estimation technique is analyzed and a more-realistic approach to calculation of percent fuel savings is suggested. Mass and enthalpy balances are provided for both methods and a typical example of furnace recuperation is detailed to illustrate the differences in the two methods of calculating the percent energy saved.

18881 (CONF-800483—(Vol.1), pp 309-310) **Use of infrared scanning in the food and fiber industry.** Kuhn, D.F. (Infrared Scanning Inc., Overland Park, KS). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Infrared scanning in the food and fiber industries (buildings, processes, and equipment) are discussed. The infrared photograph provides a permanent record with information that identifies inefficiency through poor design, inferior workmanship, or operational failure of equipment or material. It provides accurate information about heat losses in the building envelopes. (MCW)

18882 (CONF-800483—(Vol.1), pp 311-316) **Energy recovery from potato chip fryers.** McKee, H.B.; Kympton, H.W.; Arnold, J.W.; Paisan, J.J. (Frito-Lay Processing Systems Engineering, Dallas, TX). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

The design, operating characteristics, and energy savings from an energy-recovery system employed on a potato chip fryer which became operational in December, 1979, is discussed. The design incorporates a modification to an odor-control system which permits heat recovery from the fryer cooking fumes. The fumes consist primarily of water vapor (11 psia) and air (3.7 psia) at a temperature of 275°F. About 10% of the available energy is dissipated in a scrubber which removes particulate material and reduces the mixture temperature to about 195°F. This flow is passed through a water-cooled condenser. The heat absorbed in the water-cooled condenser coils is in excess of 11.5MM Btu/h for a 4200-lb/h potato chip fryer. A majority of this heat is transferred to the building water-glycol heating system. Back-up heating during periods of non-operation or as supplemental heat on extremely cold days is provided by a conventional steam-water heat exchanger. This reclaimed energy is estimated to save 76,000 gallons of No. 6 fuel oil annually by using the heat-recovery system rather than conventional steam heat. At current prices, this represents more than $36,000 per year compared to an installed cost of $81,000 for the modified system.

18883 (CONF-800483—(Vol.1), pp 316-322) **Waste energy analysis recovery for a typical food processing plant.** Miller, P.H.; Mann, L. Jr. (Louisiana State Univ., Baton Rouge). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

An energy analysis made for the Joan of Arc Food Processing Plant in St. Francisville, Louisiana indicates that a significant quantity of waste-heat energy was being released to the atmosphere in the forms of low-quality steam and hot-flue gases. Additional analysis, measurements, and observations over a period of 12 months resulted in an evaluation of the losses as well as recommended methods for the effective recovery of the waste heat energy. The waste-energy-recovery results in significant savings in energy costs as well as a reduction in the consumption of scarce fuel.

18884 (CONF-800483—(Vol.1), pp 323-325) **Stack-gas heat recovery from 100- to 1200-hp boilers.** Judson, T.H. (Peabody Gordon-Piatt, Inc., Walnut Creek, CA). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Peabody Gordon-Piatt developed and patented the packaged gas-liquid boiler heat recovery unit, trade marked the HEAT-MIZER. Heat recovery became cost effective for boilers in the 100- to 1200-hp size range when fuel costs increased. Boiler stack-gas heat recovery is applicable to steel watertube and firetube as well as cast-iron boilers. Typical applications have been in the food processing, textile, metal working, health-care, mining, and pulp and paper industries. A description of the packaged unit is given. Benefits of the system are listed and how to determine fuel and dollar savings are explained. An investigation showed that fuel savings of 4 to 15% are attainable. (MCW)

18885 (CONF-800483—(Vol.1), pp 326-335) **Energy audits in process units.** Corwin, J.D. (Union Carbide Corp., Texas City, TX). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Emphasis is placed on practical considerations in the effective organization and execution of a successful in-house energy audit of a process unit, based upon experience gained in several such audits of Gulf Coast petrochemical units. Staffing, requirements, membership qualifications, probable time span for the audit, cost-benefit ratios, and necessary line management commitment are discussed. The scope and importance of pre-audit preparation and related responsibilities are explained. Activities of the Audit Team fall into six general phases, each of which is reviewed in detail.

18886 (CONF-800483—(Vol.1), pp 336-344) **Development of an energy consumption model at a multi-product chemical plant.** Wyhs, N.A.; Logsdon, J.E. (Union Carbide Corp., Texas City, TX). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

A plant-wide energy model is being developed to be used primarily as a planning tool to evaluate the impact of energy conservation projects and plant expansions on the total plant energy balance. Statistical analysis of historical data from each production unit has generated regression equations which correlate the various energy utilities with production rate and other variables. The form of the model varies from unit to unit. Startups, shutdowns, and unit interruptions are simulated using a Monte Carlo technique. In some units, energy consumption does not correlate with production rate, which indicates that energy savings may be possible through better control of energy usage. The model should also lay the framework for an on-line energy-management program.

18887 (CONF-800483—(Vol.1), pp 356-362) **Use meters to put teeth into your conservation programs.** Hayes, J.W. (Monsanto, St. Louis, MO); Rusnak, J.J. 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

The cost of energy continues to rise at a rapid rate and the easy energy savings resulting from an era of energy affluence have been harvested. Overlaying these trends is the sobering realization that new energy sources will make little or no difference for decades, thus conservation has become the most available source of new energy. These trends are well established and the 1980's will be the decade of energy accountability and control in most industries. In-house conservation programs will be directed to determining how efficiently energy is used by various departments. This paper addresses the problems associated with assigning energy cost directly to in-plant users, either by department or by product. The solution is effective flow metering, but that is a difficult job even in more traditional applications. The problem is compounded by the fact that traditional metering concepts are inadequate for the unique problems presented by retro-metering for in-plant accountability. This paper brings the problem into a sharp, analytical focus and further offers some unique, new solutions. Finally, the experiences of companies who have committed to metering programs are investigated.

18888 (CONF-800483—(Vol.1), pp 363-367) **Ontario Hydro motor-efficiency study.** Dautovich, D.R. (Ontario Hydro, Toronto). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Electric motors consume more than one-half of the electrical energy produced by Ontario Hydro. In the residential sector, the major motor load is for refrigerators and freezers while packaged equipment dominate the motor load in the commercial market. However, this paper concentrates on the industrial market since 76% of this market's load is motors. The polyphase integral-horsepower motor is the workhorse of industry. The efficiency of the standard induction motor can be improved. The new high-efficiency motor is described and the operating cost is compared to the standard motor. Payback for high-efficiency motors is found to be about one year for continuous-duty applications. Specific instructions are presented for use in industry.

18889 (CONF-800483—(Vol.1), pp 368-372) **Writing motor specifications: how to include efficiency.** Quartermaine, B.J. (Ontario Hydro, Toronto). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

The escalating cost of electric power coupled with the rapid depletion of nonrenewable resources makes consideration of motor efficiency good sense both from economic and conservation viewpoints. The efficiency of an electric motor can be assessed during bid evaluation by applying loss penalties; however, the actual value can be influenced at an earlier stage by a careful review of what goes into the motor specification.

18890 (CONF-800483—(Vol.1), pp 373-378) **Economic realities and energy efficient polyphase integral horsepower electric motors.** Whittington, B.W. (Union Carbide Corp., St. Charles, WV). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Energy-efficient polyphase integral-horsepower electric motors are currently being vigorously promoted as a profitable method of conserving energy in many industrial and commercial applications. While the goal to be attained is indeed laudable, and must be tenaciously pursued, the economic realities of investment payback on increased efficiency versus cost of changeout, power factor, etc. must have a meaningful review before decision making. Actual savings on a discount cash-flow basis must be documented, and validity of the claims for the energy-efficient motor must be verified. Procedures used by a chemical-manufacturing plant in developing a long-range plan for evolution from a motor population of standard efficiency units to one of higher efficiency and increased reliability are discussed. Statistics publicized by the US DOE, Union Carbide's overall electrical-equipment-efficiency review, their own efficiency testing of sample small electric motors, and a pilot program to determine the number of lightly loaded motors in plant location are noted. Further depicted are an economic appraisal on the payback of replacing a standard efficiency motor with a higher-efficiency unit and an action plan for purchasing energy-efficient motors while simultaneously securing optimization of other parameters.

18891 (CONF-800483—(Vol.1), pp 379-383) **Energy conservation thru steam-trap surveys and preventive-maintenance programs.** Boynton, T. (Armstrong, Three Rivers, MI); Dewhirst, B. 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Steam-trap surveys and preventive-maintenance programs and the energy savings that may be realized from such efforts are discussed. Trap-survey organization, flexibility, simplicity, and mechanics are reviewed, including the economic justification for the survey program. Defective steam traps and their energy characteristics are discussed. An on-going preventative maintenance program can be initiated from the information derived from the survey. Sustained energy efficiency of the plant's steam system is the maintenance program's primary goal. The scope and aggressiveness of such a program are presented.

18892 (CONF-800483—(Vol.1), pp 384-386) **Steam and condensate systems.** Yates, W. (Yarway Corp., Houston, TX). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Steam systems, steam traps, and condensate systems are important factors in overall industrial-plant-efficiency economics. Factors critical to steam and condensate efficiency briefly discussed are proper steam pressure, adequate sized steam and condensate steam lines, utilization of flash steam, properly sized and installed steam traps, and a regular program of trap checking and maintenance. (MCW)

18893 (CONF-800483—(Vol.1), pp 387-393) **Managing an effective leak-sealing program.** Rinz, W.H. (Furmanite, Inc., Virginia Beach, VA). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

An on-line leak-sealing program is an extremely effective method of cost savings to industrial plants. The dollars a plant saves can be direct and dramatic as in an avoided system shutdown, or subtle and analytical as in a long-term maintenance program.

Either way, the cost savings are an important part of a complete leak-sealing program; in addition, to dollars saved, noise is reduced, environment is safeguarded, and energy is conserved.

18894 (CONF-800483—(Vol.1), pp 394-407) **Engineered approach to energy and maintenance effective steam trapping.** Krueger, R.G.; Wilt, G.W. (Flexitallic Gasket Co., Inc., Camden, NJ). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

The engineered approach to steam-trap sizing, selection, and application has proven effective in significantly reducing a plant's fuel consumption, maintenance, and trap-replacement costs while improving thermal efficiency and overall steam-system performance. New field-test procedures for measuring condensate load and steam loss have proven valuable in sizing traps and to determine which trap is the most energy-efficient. The combination of using the engineered approach to steam trapping, field tests to verify trap performance, and good maintenance practices has contributed to a major reduction in energy consumption of 10 to 50% in many industrial plants.

18895 (CONF-800483—(Vol.1), pp 408-413) **Expansion-joint concepts for high-temperature insulation systems.** Harrison, M.R. (Johns-Manville Sales Corp., Denver, CO). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

As high-temperature steam and process piping expands with heat, joints begin to open between the insulation sections, resulting in increased energy losses and possible unsafe surface temperatures. The advantages of single-layer vs double-layer thermal-insulation construction are discussed. The focus of the discussion is on rigid-pipe insulation such as calcium silicate applied to high-temperature steam or process piping. Pipe insulations do not, in general, exhibit significant thermal expansion. Expansion gaps that occur when the piping expands and the insulation remains the same dimension are discussed. (MCW)

18896 (CONF-800483—(Vol.1), pp 414-417) **Energy savings by veneering.** Cook, T.H. (Babcock & Wilcox Co., Augusta, GA). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

In instances when it is not economically justifiable to replace a serviceable conventional lining or install a new furnace, hot-face veneering is useful and acceptable. Wallpaper treatment and modular veneering types are discussed. Veneering with Ceramic Fiber in ceramic, ferrous heating, reheating and heat-treating furnaces, nonferrous heating, and chemical processing furnaces are briefly discussed. A very adequate return on investment by decreasing fuel usage, prolonging refractory life, and reducing maintenance cost are noted. A detailed furnace analysis and computer study are recommended prior to undertaking a veneering program. (MCW)

18897 (CONF-800483—(Vol.1), pp 418-421) **Lining over refractory: conserve energy & capital.** Jost, M.L.; Barrows, G.L. (Carborundum Co., Niagara Falls, NY). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

The lining over refractory (LOR) technique is being used as an effective means for improving existing furnace efficiency. The layered and module techniques are discussed and costs are compared. Ceramic fiber linings over refractory have proven themselves capable of substantial fuel savings with a minimal capital outlay. LOR's are easily installed and provide additional benefits of increased output, reduced lining maintenance, lower skin temperatures, protection of the existing refractory, and reduced unit noise levels.

18898 (DOE/CS/40265—T1) **Energy-efficient electric motors study.** (Market Facts, Inc., Washington, DC (USA)). 23 Mar 1981. Contract AC01-79CS40265. 144p. NTIS, PC A07/MF A01.

The study identifies the industrial decision makers, investigated the information they needed to know, how they can best be reached, and the motivating factors for purchasing energy-efficient electric motors. A survey was conducted of purchasers of integral horsepower polyphase motors. The survey measured current knowledge of and awareness of energy-efficient motors, decision-making criteria, information sources, purchase and usage patterns, and related factors. The survey data were used for the electric motor market penetration analysis. Additionally, a telephone survey was made. The study also provides analyses of distribution channels, commercialization constraints, and the impacts of government programs and rising energy prices. A description of study findings, conclusions, and recommendations is presented. Sample questionnaires and copies of letters to respondents are presented in 3 appendices. Appendices D and E contain descriptions of the methods used. (MCW)

18899 (DOE/R5/10251—1) **Low cost process heat recovery. Interim report.** Theisen, P.; McCray, J. (Theisen (Phillip), Madison, WI (USA); McCray (James), Madison, WI (USA)). 1980. Contract FG02-80R510251. 32p. NTIS, PC A03/MF A01.

The objectives of this project are to analyze waste heat recovery potential, economic analysis, heat exchanger and system design, and computer analysis programs. The heating demand and heat recovery potential at a Madison neighborhood bakery was conducted. The building has steam heat and natural gas is used in the hot water heater, the cooking stoves, and in the baking oven. Heat recovery potential was analyzed based upon fuel consumption in the baking oven, flue gas temperature, mass flow rate, and hours of oven operation. The feasibility of waste heat recovery systems is analyzed using life cycle cost and life cycle savings. For a first approximation, hand calculations were performed for air-to-air flat plate, fin-plate, and liquid-to-air tube type heat exchangers using the temperature and mass flow data from a pizza restaurant in Madison. Then a heat exchanger analysis program was written in interactive BASIC. The analysis indicates that heat recovery using the flat-plate and fin-plate exchanger designs is technically feasible and yields high effectiveness. (MCW)

18900 (DOE/SF/01916—T1) **Waste-heat recovery system for commercial cooking appliances. Final report.** Jones, R.J. (Hydrocoil, Inc., City of Commerce, CA (USA)). Dec 1980. Contract FG03-78SF01916. 21p. NTIS, PC A02/MF A01.

Installation of the Hydrocoil Waste Heat Recovery System over a battery of gas-fired commercial cooking appliances in a restaurant in Pasadena, California, is discussed. Installation of the equipment resulted in gas usage reduction, a savings to the restaurant owner of $70/month at a gas cost of $0.26/ccf. The term load factor or the ratio of actual usage compared to the maximum potential burner consumption of gas for commercial cooking equipment is defined. (MCW)

18901 (DOE/SF/10538—T8(Vol.2)) **Studies on advanced overseas energy technologies. Volume II. Final report.** Straus, R.W.; Thurman, R.S.; Carsey, J.N. (Galaxy, Inc., Washington, DC (USA)). Mar 1981. Contract AC03-79SF10538. 166p. NTIS, PC A08/MF A01.

Separate abstracts are prepared for five chapters. (MCW)

18902 (DOE/SF/10538—T8(Vol.2), pp 167-198) **Waste heat recovery.** Mar 1981. NTIS, PC A08/MF A01.

In Studies on advanced overseas energy technologies. Volume II. Final report.

A state of the art of waste heat recovery technologies in United Kingdom, USA, Switzerland, Japan, Norway, Sweden, Federal Republic of Germany, Spain, France, Denmark, and Italy is presented. (MWC)

18903 (ETSU-R—8) **Dissaggregated model of energy consumption in UK industry.** Bush, R.P.; Chadwick, A.T. (Energy Technology Support Unit, Harwell (UK)). Dec 1979. 81p. Energy Technology Support Unit, AERE, Harwell, England.

A model of energy use in UK industry which was developed within ETSU for the purpose of energy research, development, and demonstration planning is presented. In Section II, Patterns of Energy Use, the following are discussed: sectors, energy conver-

sion, end uses, useful and effective energy. It also explains the method of calculation, summarizes results on diagrams, and shows the effect of taking into account the detailed patterns of energy end use and industrial structure. Section III supplies additional details and is followed by comprehensive tables. An appendix shows the composition of the chosen sectors (engineering and other metal trades; food, drink, and tobacco; chemicals and allied trades; textiles, leather, and clothing; paper, printing, and stationery; building materials; iron and steel). (MCW)

18904 **(SAND—81-0475) Reclaiming sulfur hexafluoride: a review of systems in use at Sandia National Laboratories.** Staller, G.E.; Aker, M.F. Jr. (Sandia National Labs., Albuquerque, NM (USA)). Feb 1981. Contract AC04-76DP00789. 16p. NTIS, PC A02/MF A01.

Sulfur hexafluoride (SF_6) gas is being reclaimed and reused utilizing three modified commercial SF_6 gas reclaimers. Applications are discussed, as well as problems encountered during operation of these units. Estimates of cost savings to Department 4250, when using the reclaimers, are also discussed.

3206 Municipalities And Community Systems

REFER ALSO TO CITATION(S) 18241, 18362, 18735, 19275

18905 (CONF-800483—(Vol.1), pp 22-28) **Energy recovery from solid waste for small cities: has the time really come.** Winn, W.T. Jr. (Kindle, Stone, & Associates, Inc., Longview, TX); Paxton, W. 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

The City of Longview, Texas is evaluating modular, two-stage incineration with waste-heat recovery to produce steam for sale to industrial consumers. An envisioned 150-tpd waste-disposal facility would serve the area population of approximately 100,000. Estimates for operating cost and steam-conversion efficiency were based on historical data obtained from a similar facility located in Salem, Virginia, which is described. The total projected break-even cost in 1982 for production of 150-psig saturated steam for a completely consumptive use was $7.95 per 1000 lb. The projected break-even cost in 1982 for 600-psi steam superheated to 700°F for a consumptive use was $8.72 pr 1000 lb, excluding the cost of water-deionization facilities. These costs compare favorably with projected costs of steam production using natural gas as a boiler fuel but are not competitive when compared to use of locally available lignite. The results indicate that the time has come for smaller cities with a potential for industrial-steam sales to consider energy recovery from solid waste using modular, two-stage incineration with waste-heat recovery.

18906 **(DOE/BP—42) Energy-conservation program of the Division of Substation and Control Engineering.** (USDOE Bonneville Power Administration, Portland, OR). Apr 1981. 64p. NTIS, PC A04/MF A01.

Energy conservation projects undertaken by BPA that could benefit residential and commercial users and development of prototype equipment are described. Progress reports are presented and directions that the projects will take are indicated. The first projects presented are those being done at BPA's Midway Residential Community: studies on air infiltration and weatherization, and evaluation of such energy conservation measures as heat pump and solar water heaters. The next section involves an energy audit and retrofit program undertaken to reduce energy consumption in BPA's own buildings. The third section, also concerned with BPA's efforts to reduce internal energy consumption, presents the application of passive solar techniques to the design of new BPA buildings. The fourth section reports on a system developed to utilize waste thermal energy from transformers and solar energy for space heating and cooling. The fifth section also involves the development of a prototype system, one to monitor energy usage of industrial equipment. The final sections report on projects involving solar and wind energy, the Photovoltaic Applications Program, and the Mod-2 Wind Generator project at Goodnoe Hills. (MCW)

18907 **(NP—25324) Electric Utility Rate Design Study: load controls and equipment for using off-peak energy.** (Little (Arthur D.), Inc., Cambridge, MA (USA)). 15 May 1979. 286p. EPRI, Palo Alto, CA.

The specific electrical load-management programs established by 10 utilities in the US, three utility thermal storage experiments, and three 2-way utility communication systems are described. Chapter II discusses the concerns of utilities and regulatory agencies regarding certain kinds of load-management programs. The major issues are benefit/cost methodologies, consumer reaction and participation, load identification and projections, equipment capabilities and cost, and local-utility characteristics. The status of information on load-management programs is reviewed in Chapter III. Issues of concern cited in Chapter II are compared with information developed in the individual utility analyses of Chapter V. The current programs of testing or study related to load management are also identified. Chapter IV briefly describes the types of load-management programs employed by the ten utilities selected for analysis. The electrical loads under control consist of residential water heaters, space-heating systems, central air conditioners, and irrigation pumps. Each utility program, experiment, and communication system is discussed individually in Chapter V. Program analyses include the following topics: general nature of program, details of operation, assessment of performance, special program characteristics, discussion of equipment, discussion of costs, and personnel contacted. Chapter VI contains a description of the latest equipment developed for time-of-day metering by Duncan Electric Company, General Electric Company, Sangamo Electric Company, the Westinghouse Electric Corporation, and Cutler-Hammer, Inc. Products and costs are discussed specifically. The appendices contain references cited in this report, the Electric Utility Rate Design Study (EURDS) Report Guide (which includes a form for ordering EURDS reports from EPRI) and literature from load-management-equipment manufacturers.

18908 **(P—500-80-037) Cogeneration feasibility study for City of Los Angeles, civic center municipal buildings: City Hall, City Hall East, City Hall South, Parker Center. Consultant report.** (Los Angeles City Bureau of Engineering, CA (USA)). Jul 1980. 194p. California Energy Commission, Sacramento.

An evaluation of the feasibility of installing a cogeneration system in the City of Los Angeles Civic Center Municipal Building is made. Two systems are evaluated: one or two 800-kilowatt combustion turbine-generator units with exhaust heat recovery for steam generation. A net present value economic analysis shows more favorable economics for the single 800-kilowatt unit. Economic feasibility was tested under six different projected fuel supply and economic scenarios. This system would cost $665,000 to install and would supply all of the project's heating and cooling energy needs. It should be emphasized that the nature and size of the heat load presently limits cogeneration electric output to less than 25% of the City Hall complex requirements. The project area comprises 2,265,000 square feet of office space. It is recommended that the City explore the possibility of providing cogenerated steam to agencies other than the City at locations neighboring the City Hall complex. Such an arrangement would provide an opportunity for producing considerably more cogenerated electricity than is possible with the II steam load of the City Hall complex alone. Information on permits and permit requirements, ownership and financing alternatives, and project time requirements are presented.

18909 **Energy service corporations: opportunities for California utilities.** Sacramento, CA; California Energy Commission (1980). 176p. (NP—25379).

The financial circumstances and energy service corporation opportunities of California investor-owned electric or electric/gas utilities are explored. Chapter II provides background information on the national utility context and the current financial status of the state's major investor-owned electric, electric/gas utilities; Chapter III reviews two utility finance/electricity supply strategies for the 1980s; Chapter IV highlights California and national programs requiring increased utility energy service capabilities; and Chapter V outlines concerns and recommendations regarding utility transformation toward broader energy service roles. (MCW)

18910 **Nontraditional energy technologies: issues and actions.** Deller, N.J. Sacramento, CA; California Energy Commission (1980). 61p. (NP—25386).

The criteria for selecting technologies covered in this report are listed. General background information on wind electric systems, geothermal electric direct heat systems, cogeneration, small hydroelectric, biomass conversion processes, and alcohol fuels, as well as an action plan to realize the maximum reasonable energy impact from each technology are presented. The action plan covers the next two years for each technology to resolve key impediments to development and to obtain a maximum reasonable level of energy production. Major milestones or events that must take place if the maximum reasonable projections are to be achieved are charted. (MCW)

3209 Education And Public Relations

REFER ALSO TO CITATION(S) 18875, 18876

18911 (CONF-800483—(Vol.1), pp 237-241) **Energy-systems technology: a development in experimental learning.** Tumber, A.J. (Mohawk Coll., Hamilton, Ontario). 1980. NTIS, PC A20/MF A01.

From 2. annual conference on industrial energy conservation technology and exhibition; Houston, TX, USA (13 Apr 1980).

Energy Systems Technology is a three-year diploma program which started at Mohawk College in September 1977 and will produce its first graduate technologists in June 1980. The program of studies is multi-disciplinary and includes mechanical and electrical subjects with an energy orientation. Computers and communications are the secondary subject areas. The experience gained in the development and operation of Energy Systems as a co-operative program is described together with experimental learning which is used for assessing the students' learning while on the job.

33 ADVANCED AUTOMOTIVE PROPULSION SYSTEMS

3301 Internal Combustion Engines

REFER ALSO TO CITATION(S) 18927, 18945, 18947, 18948, 18986, 19424

18912 **(DOE/NASA/0106—1) Analytical design of an advanced radial turbine.** Large, G.D.; Finger, D.G.; Linder, C.G. (Garrett Turbine Engine Co., Phoenix, AZ (USA)). Feb 1981. Contract AI01-77CS51040. 156p. (NASA-CR—165170; GARRETT—31-3653). NTIS, PC A08/MF A01.

The analytical design of an advanced radial turbine, which is part of an optimum ceramic radial inflow, single-stage turbine system for an advanced automotive gas turbine engine is reported. The turbine study program is based on an advanced gas turbine cycle, 100.67-kW (135-shp) engine for use in a 1588-kg (3500-lb) automobile, with a specific fuel consumption of 0.227 kg/kW-hr (0.373 lb/hp-hr). Utilization of high turbine cycle temperatures of 1370°C and ceramic materials are prime features of this study. The program objective was to investigate the effects of tip speed, nonradial rotor blading, inducer-to-exducer work split, and deswirl vanes on the system efficiency and mechanical reliability of a single-stage, ceramic, radial turbine designed to meet the performance requirements of an advanced automotive gas turbine cycle. Analysis results indicate that, based on projected 1983 aerodynamic performance and ceramic material properties, radial blade rotor configurations with a tip speed of 701 m/sec (2300 fps) are feasible and satisfy the goals of 87.0% system efficiency and 0.9999 cumulative probability of success mechanically. As compared with the blade stress complications of nonradial rotor configurations, from aerodynamic, mechanical, and off-design considerations, the radial-blade rotor appears to offer the lowest overall risk and is the optimum configuration considered in this study.

18913 **(DOE/NASA/2749—79/1) Baseline automotive gas-turbine engine development program. Final report.** Wagner, C.E.; Pampreen, R.C. (eds.). (Chrysler Corp., Detroit, MI (USA)). Apr 1979. Contract AC02-76CS52749. 180p. (NASA-CR—159670; COO—2749-42). NTIS, PC A09/MF A01.

This is the first of four volumes of the contract final report, which summarizes all of the work performed in a government-sponsored Automotive Gas Turbine Development Program. In this first volume of the contract final report, results are presented from tests which were conducted on a Baseline Engine to document the Automotive Gas Turbine State-of-the-Art at the start of the program and to evaluate certain component improvement concepts. The documentation consisted of defining the performance characteristics of the engine and of a vehicle powered by this engine. Component improvements in the Baseline Engine were to be evaluated on engine dynamometer tests, in the complete vehicle on a chassis dynamometer, and on road tests. These concepts included: advanced combustors, ceramic regenerators, an integrated control system, low-cost turbine material, a continuously variable transmission, power-turbine-driven accessories, power augmentation, and linerless insulation in the engine housing. Successful verification of improvements was to be the basis of upgrading the engine by incorporating these technology advancements in a new design called the Upgraded Engine.

18914 **(DOE/NASA/2749—79/3) Conceptual design study of an improved automotive gas-turbine powertrain. Final report.** Wagner, C.E.; Pampreen, R.C. (eds.). (Chrysler Corp., Detroit, MI (USA)). Jun 1979. Contract AC02-76CS52749. 211p. (NASA-CR—159672; COO—2749-40). NTIS, PC A10/MF A01.

This is the third of four volumes of the contract final report which summarizes all of the work performed in a government-sponsored Automotive Gas Turbine Development Program. In this third volume of the contract final report, an assessment is made of the potential for developing an Improved Gas Turbine (IGT) propulsion system. The design was based on the application of current and near-term technology in a concept targeted to enter production development by 1983. The study was directed toward defining automotive gas turbine concepts with significant technological advantages over the spark ignition (SI) engine. Possible design concepts were rated with respect to fuel economy and near-term application. A program plan was prepared which outlines the development of the IGT concept that best met the goals and objectives of the study. Identified in the program plan is the research and development work needed to meet the goal of entering a production engineering phase by 1983. The fuel economy goal of the study was to show at least a 20% improvement over a conventional 1976 SI engine/vehicle system. On the bases of achieving the fuel economy goal, of overall suitability to mechanical design, and of automotive mass production cost, the powertrain selected was a single-shaft engine with a radial turbine and a continuously variable transmission (CVT). Design turbine inlet temperature was 1150°C. Reflecting near-term technology, the turbine rotor would be made of an advanced superalloy, and the transmission would be a hydromechanical CVT. With successful progress in long-lead R and D in ceramic technology and the belt-drive CVT, the turbine inlet temperature would be 1350°C to achieve near-maximum fuel economy.

18915 **(DOE/NASA/2749—79/4) Materials review for improved automotive gas-turbine engine. Final report.** Belleau, C.; Ehlers, W.L.; Hagen, F.A. (Chrysler Corp., Detroit, MI (USA)). Apr 1978. Contract AC02-76CS52749. 94p. (NASA-CR—159673; COO—2749-47). NTIS, PC A05/MF A01.

Advanced materials are the key to achieving the performance and fuel economy goals of improved automotive gas turbine engines. The potential role of superalloys, refractory alloys, and ceramics in the hottest sections of future engines that may be required to operate with turbine inlet temperatures as high as 1370°C (2500°F) is examined. These high temperature materials are reviewed. The characteristics of the best modern conventional superalloys, directionally solidified eutectics, oxide dispersion strengthened alloys, and tungsten fiber reinforced superalloys are reviewed; and the most promising alloys in each system are compared on the

basis of maximum turbine blade temperature capability. The requirements for improved high temperature protective coatings and special fabrication techniques for these advanced alloys are discussed. Chromium, columbium, molybdenum, tantalum, and tungsten alloys are reviewed. On the basis of properties, cost, availability, and strategic importance, molybdenum alloys are found to be the most suitable refractory material for turbine wheels for mass produced engines. Ceramic material candidates are reviewed and ranked according to their probability of success in particular applications. Various forms of, and fabrication processes for both silicon nitride and silicon carbide, along with SiAlON's are investigated for use in high-stress and medium-stress high temperature environments. Low-stress glass-ceramic regenerator materials are also investigated. Treatment is given to processing requirements, such as coatings for oxidation/corrosion protection, joining methods, and machining technology. Economics of ceramic raw materials, and of various processing methods are discussed. Conclusions are drawn, and recommendations for areas of further research are proposed for consideration and/or adoption.

18916 **(NASA-CR—165250) Combustor liner durability analysis.** Moreno, V. (Pratt and Whitney Aircraft, East Hartford, CT (USA). Commercial Products Div.). Feb 1981. 85p. (PWA—5684-19). Pratt & Whitney Aircraft Group, East Hartford, CT.

The results of the 18 month Combustor Liner Durability Analysis Program (NAS3-21836) performed by Pratt & Whitney Aircraft are presented. The objective of the program is to evaluate the use of advanced three-dimensional transient heat transfer and non-linear stress-strain analyses for modeling the cyclic thermomechanical response of a simulated combustor liner specimen. Cyclic life prediction technology for creep/fatigue interaction is evaluated for a variety of state-of-the-art tools for crack initiation and propagation. The sensitivity of the initiation models to a change in the operating conditions is also assessed.

18917 **(SAND—81-8637) Experimental techniques in engine combustion analysis.** Dyer, T.M. (Sandia National Labs., Livermore, CA (USA)). Mar 1981. Contract AC04-76DP00789. 23p. (CONF-810330—2). NTIS, PC A02/MF A01.

From Combustion Institute/Central States Section technical meeting; Warren, MI, USA (23 Mar 1981).

A wide variety of experimental diagnostic techniques have been developed to more fully characterize the physical and chemical processes occurring in an i.c. engine. These diagnostics have been categorized depending upon the emphasis of the experiment or the particular part of the engine cycle under investigation: characterization of precombustion initial conditions, combustion and emission diagnostics, and visualization/spatial mapping techniques. The current state of development of each technique is reviewed with suggestions made for future directions. The future development and implementation of engine diagnostics should focus on spatial mapping techniques, the development of an in-situ NO/sub x/ diagnostic, more extensive use of computerized data acquisition and analysis capabilities, and the simultaneous implementation of multiple diagnostic techniques.

18918 (UCRL—52000-81-4, pp 22-29) **Flame quenching in internal combustion engines.** Apr 1981. NTIS, PC A03/MF A01.

In Energy and technology review.

Computer models are being used at LLNL to pinpoint the origins of unburned hydrocarbons emitted by internal combustion engines. Model calculations show that, contrary to prevailing assumptions, these pollutant emissions do not result primarily from flame quenching on the metal walls of the combustion chamber. Instead, flame quenching in other areas - piston ring crevices, valve seat crevices, and spark plug threads - may be responsible.

18919 **Predicting customer octane satisfaction.** Jones, E.R.; Ingamells, J.C. Warrendale, PA; Society of Automotive Engineers, Inc. (1981). 11p. (CONF-810206—20).

From Society of Automotive Engineers international engineering congress and exposition; Detroit, MI, USA (23 Feb 1981).

In setting gasoline octane specifications, it is important to be able to predict the percentage of customers that object to spark knock (ping) at a given octane level. Direct information about octane satisfaction for trained raters, but not for customers, is available from annual surveys conducted by the Coordinating Research Council (CRC). This paper describes a simple mechanistic model for relating customer octane requirements (OR's) with trained rater OR's. Two large CRC studies involving both customers and raters support its use.

18920 **Soots from used diesel-engine oils: their effects on wear as measured in 4-ball wear tests.** Rounds, F.G. Warrendale, PA; Society of Automotive Engineers, Inc. (1981). 16p. (CONF-810206—21).

From Society of Automotive Engineers international engineering congress and exposition; Detroit, MI, USA (23 Feb 1981).

Diesel engine oil soots from different engines have the appearance of carbon black but contain significant concentrations of engine oil additive elements. Evaluation of the soots in 4-ball wear tests supported the theory that the soots reduce the antiwear additive effectiveness by preferentially adsorbing the active antiwear additive components before they can form the essential antiwear surface coating rather than removing the surface coatings by abrasion after they are formed. Engine load and exhaust gas recirculation have large effects on the soot prowear characteristics, whereas engine refinements, engine make and oil type have lesser effects. No antiwear additives were found more effective than the currently used zinc dialkyldithiophosphates. Several preferential adsorber additives were effective in simple blends but not in fully formulated engine oils.

18921 **Developing road octane correlations from octane-requirement surveys.** Ingamells, J.C.; Jones, E.R. Warrendale, PA; Society of Automotive Engineers, Inc. (1981). 9p. (CONF-810206—30).

From Society of Automotive Engineers international engineering congress and exposition; Detroit, MI, USA (23 Feb 1981).

It is often of interest to predict octane performance in cars as a function of research and motor octane numbers. Prediction equation parameters can be developed by regressing data taken directly from Coordinating Research Council reports on annual car octane requirement surveys. However, there is a major problem with these data. They are pooled in such a way that data points for different fuel series do not correspond to the same cars in each case. This paper presents a better method that makes use of individual car data and also fuel data.

18922 **Comparison of vehicle/fuel test procedures with customer driving.** Klen, D.S. Warrendale, PA; Society of Automotive Engineers, Inc. (1981). 21p. (CONF-810206—31).

From Society of Automotive Engineers international engineering congress and exposition; Detroit, MI, USA (23 Feb 1981).

An instrumented chase car was used to observe and record driving patterns for over 3000 motorists in three different regions. How these motorists actually drove their cars was then compared to three standardized driving procedures used to evaluate fuels: the EPA's city and highway driving schedules used for emissions and fuel economy testing, the CRC E-15 Technique for Determination of Octane Number Requirements of Light-Duty Vehicles, and the CRC Cold Start and Driveaway Test Procedure used in fuel volatility work to evaluate vehicle driveability. All of these driving procedures were found to differ from the way motorists actually drove their cars. Accelerations are generally less rapid in the EPA cycles, and engine loading is lower than it is on the road in both the acceleration and cruise modes. Accelerations in the CRC E-15 technique were not consistent with the way motorists actually accelerate and the magnitude of the accelerations depended on the car being rated. In the CRC driveability cycle, some of the maneuvers were difficult to follow, resulting in poor repeatability of the accelerations.

18923 **Fuel-tolerance tests with the Ford PROCO engine.** Choma, M.A.; Havstad, P.H.; Simko, A.O.; Stockhausen, W.F. Warrendale, PA; Society of Automotive Engineers, Inc. (1981). 7p. (CONF-810206—7).

From Society of Automotive Engineers international engineering congress and exposition; Detroit, MI, USA (23 Feb 1981).

A variety of fuel tolerance tests were conducted utilizing Ford's PROCO engine, a direct fuel injection stratified charge

engine developed for light duty vehicles. These engine tests were run on the dynamometer and in vehicles. Data indicate an 89 RON octane requirement, relatively low sensitivity to volatility characteristics and good fuel economy, emission control and operability on a certain range of petroleum fuel and alcohol mixes including 100% methanol. Fuels such as JP-4 and Diesel fuel are not at present suitable for this engine. There were no engine modifications tested that might improve the match between the engine and a particular fuel. The 100% methanol test was conducted with a modified fuel injection pump. Durability aspects including compatibility of various fuels with the materials in the fuel system were not addressed.

18924 **Effect of gear lubricant on fuel economy as measured in a line haul truck fleet.** Adams, J.H.; Frost, K.A.; Hartmann, L.M.; Painter, L.J. Warrendale, PA; Society of Automotive Engineers, Inc. (1981). 8p. (CONF-810206—9).

From Society of Automotive Engineers international engineering congress and exposition; Detroit, MI, USA (23 Feb 1981).

A gear lubricant field test in 32 new Class 8 vehicles totaling over 2 million miles (3.2 million kilometers) determined that one lubricant compounded with a potassium borate additive can be used in both axle and transmissions, providing a 3.5% benefit in fuel economy compared to conventional lubricants, while giving superior wear protection and oxidation stability.

18925 **Comparison of gasoline and diesel automobile fuel economy as seen by the consumer.** McNutt, B.D. Warrendale, PA; Society of Automotive Engineers, Inc. (1981). 16p. (CONF-810206—13).

From Society of Automotive Engineers international engineering congress and exposition; Detroit, MI, USA (23 Feb 1981).

A number of different and perhaps conflicting claims have been made about the fuel-economy benefits of diesel-fueled automobiles versus their gasoline-fueled counterparts. While a traditional figure of a 25% fuel-economy gain with diesels is often used, this figure has varied due to differences in vehicle performance, driving conditions, fuel Btu content, and advances in engine design (particularly in spark-ignition engines). This paper looks at fuel economy, in the broad sense of the term, from the consumer's perspective. The analysis is based on EPA-measured fuel economy in model year 1980, actual on-road fuel economy for 1975 to 1980 automobiles, and recent fuel price data for gasoline and diesel fuel. Comparisons of gasoline and diesel fuel economy that account for these three variables are presented. Also considered is the way that gasoline and diesel fuel economy comparisons may change in the future with changes in fuel prices, emission standards, and engine design.

18926 **Fate of ashless dispersants in gasoline engines as followed by carbon-14 radiolabeling.** Erdman, T.R. Warrendale, PA; Society of Automotive Engineers, Inc. (1981). 12p. (CONF-810206—17).

From Society of Automotive Engineers international engineering congress and exposition; Detroit, MI, USA (23 Feb 1981).

The use of carbon-14 radiolabeled succinimides and succinate esters to investigate the role of ashless dispersants in controlling deposit formation in gasoline engines is described. Analysis of used oils, varnish deposits, and insolubles from several gasoline engine tests showed that: ashless dispersants were not significantly broken down chemically in service; dispersants played an active role in the processes leading to deposits and were evenly distributed in varnish throughout the engine; insolubles in the oil were agglomerations of small, primary particles of about 300 to 400 dia; and a major portion of the dispersant in used oils was bound up with polar organic and inorganic species and was unable to assist in dispersing particles. The implication of these findings on the development of new additives and crankcase oil formulations is discussed.

3302 External Combustion Engines

18927 **(DOE/CS/51011—T1) Potential impacts of Brayton- and Stirling-cycle engines.** Heft, R.C. (Jet Propulsion Lab., Pasadena, CA (USA)). 15 Nov 1980. Contract AI01-76CS51011. 147p. (JPL-PUB—81-22). NTIS, PC A07/MF A01.

Two engine technologies (Brayton cycle and Stirling cycle) currently being pursued by the US Department of Energy were examined for their potential impacts if they achieved commercial viability. An economic analysis of the expected response of buyers to the attributes of the alternative engines was performed. Hedonic coefficients for vehicle fuel efficiency, performance and size were estimated for domestic cars based upon historical data. The marketplace value of the fuel efficiency enhancement provided by Brayton or Stirling engines was estimated. The effect upon various economic sectors of a large scale change-over from conventional to alternate engines was estimated using an economic input-output analysis. Primary effects were found in fuels refining, non-ferroalloy ores and ferroalloy smelting. Secondary effects were found in mining, transport, and capital financing. Under the assumption of 10 years for plant conversions and 1990 and 1995 as the introduction date for turine and Stirling engines respectively, the comparative fuel savings and present value of the future savings in fuel costs were estimated.

3303 Electric-powered Systems

REFER ALSO TO CITATION(S) 18847

18928 **(ANL/OEPM—80-10) Research, development, and demonstration of lead-acid batteries for electric vehicle propulsion. Annual report, 1980.** (Eltra Corp., Plymouth Meeting, PA (USA). C and D Batteries Div.). Mar 1981. Contract W-31-109-ENG-38. 76p. NTIS, PC A05/MF A01.

The progress and status of Eltra's Electric Vehicle Battery Program during FY-80 are presented under five divisional headings: Research on Components and Processes; Development of Cells and Modules for Electric Vehicle Propulsion; Sub-Systems; Pilot Line Production of Electric Vehicle Battery Prototypes; and Program Management.

18929 **(ANL/OEPM—80-11) Research, development, and demonstration of lead-acid batteries for electric-vehicle propulsion. Annual report, 1980.** (Exide Management and Technology Co., Yardley, PA (USA)). Mar 1981. Contract W-31-109-ENG-38. 229p. NTIS, PC A11/MF A01.

The first development effort in improving lead-acid batteries fore electric vehicles was the improvement of electric vehicle batteries using flat pasted positive plates and the second was for a tubular long life positive plate. The investigation of 32 component variables based on a flat pasted positive plate configuration is described. The experiment tested 96 - six volt batteries for characterization at 0, 25, and 40°C and for cycle life capability at the 3 hour discharge rate with a one cycle, to 80% DOD, per day regime. Four positive paste formulations were selected. Two commercially available microporous separators were used in conjunction with a layer of 0.076 mm thick glass mat. Two concentrations of battery grade sulfuric acid were included in the test to determine if an increase in concentration would improve the battery capacity sufficient to offset the added weight of the more concentrated solution. Two construction variations, 23 plate elements with outside negative plates and 23 plate elements with outside positive plates, were included. The second development effort was an experiment designed to study the relationship of 32 component variables based on a tubular positive plate configuration. 96-six volt batteries were tested at various discharge rates at 0, 25, and 40°C along with cycle life testing at 80% DOD of the 3 hour rate. 75 batteries remain on cycle life testing with 17 batteries having in excess of 365 life cycles. Preliminary conclusions indicate: the tubular positive plate is far more capable of withstanding deep cycles than is the flat pasted plate; as presently designed 40 Whr/kg can not be achieved, since 37.7 Whr/kg was the best tubular data obtained; electrolyte circulation is impaired due to the tight element fit in the container; and a redesign is required to reduce the battery weight which will improve the Whr/kg value. This redesign is complete and new molds have been ordered.

18930 **(DOE/CE/51213—01) Near-term electric test vehicle ETV-2. Phase II. Final report.** (AiResearch Mfg. Co., Los Angeles, CA (USA)). Apr 1981. Contract AC03-76CS51213. 320p. NTIS, PC A14/MF A01.

A unique battery-powered passenger vehicle has been developed that provides a significant improvement over conventional electric vehicle performance, particularly during stop-and-go driving. The vehicle is unique in two major respects: (1) the power system incorporates a flywheel that stores energy during regenerative braking and makes possible the acceleration capability needed to keep up with traffic without reducing range to unacceptable values; and (2) lightweight plastic materials are used for the vehicle unibody to minimize weight and increase range. These features were analyzed and demonstrated in an electric test vehicle, ETV-2. Characteristics of this vehicle are summarized. Information is presented on: vehicle design, fabrication, safety testing, and performance testing; power system design and operation; flywheel; battery pack performance; and controls and electronic equipment. (LCL)

18931 **(DOE/NASA/51044—18) Electric vehicle motors and controllers.** Secunde, R.R. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1981. Contract AI01-77CS51044. 33p. (NASA-TM—81760; CONF-810632—1). NTIS, PC A03/MF A01.

From 5. international workshop on rare earth-cobalt magnets and their applications; Roanoke, VA, USA (7 Jun 1981).

The goal of DOE's Electric and Hybrid Vehicle Program is to promote and accelerate the development and public use of vehicles that use electricity as the principal source of propulsion energy. Successful achievement of this goal will ultimately result in significant petroleum savings to the nation. However, the design, performance, and cost of propulsion components must be improved before commercially attractive electric vehicles can be built. Improved and advanced components being developed under the NASA-managed propulsion portion of the DOE program include electronically commutated permanent magnet motors of both drum and disk configurations, an unconventional brush-commutated motor, and ac induction motors and various controllers.

18932 **(SRD—79-076) Near-term electric vehicle. Phase II. Final report.** (General Electric Co., Schenectady, NY (USA). Corporate Research and Development Dept.). 28 Mar 1980. Contract AC03-76CS51294. 467p. NTIS, PC A20/MF A01.

The work performed by the General Electric Company and its subcontractors as part of the Near-Term Electric Vehicle Program from April 1977 through July 1979 is described. The purpose of this program was to develop and deliver to the DOE two advanced experimental electric cars known as Electric Test Vehicles (ETV's). These vehicles incorporate technology improvements to achieve a level of performance substantially better than previous state-of-the-art electric vehicles. Specific objectives were established for vehicle performance, safety, cost, and consumer acceptance. The vehicles were also specified to be suitable for production by the mid 1980's. The DOE objectives have generally been achieved. With some further advances in battery technology expected by 1982, all performance and cost objectives can be satisfied. The Electric Test Vehicles delivered under this contract were developed as a total system, with careful attention to the interactions between vehicle body and chassis, electrical drive subsystem, and propulsion battery. Beginning with the creation of system specifications, each step of the design and development process was controlled to achieve the best end result. Electrical, mechanical and control interfaces were also carefully analyzed and controlled to insure compatibility between subsystems. Each major subsystem of the electric Test Vehicle displays new technology developments which contribute to the vehicle's improved performance. The development process and significant technical accomplishments for each subsystem, (Vehicle, Electrical Drive, and Battery), are described.

18933 **(UCRL—85851) Application analysis of energy-storage systems for transportation.** O'Connell, L.G.; Spogen, L.R. (Lawrence Livermore National Lab., CA (USA)). 13 Apr 1981. Contract W-7405-ENG-48. 19p. (CONF-810459—2). NTIS, PC A02/MF A01.

From Technical and economic analysis contractors' meeting; Chicago, IL, USA (21 Apr 1981).

An application analysis study of energy storage systems for automotive propulsion was conducted over a period of four years. The purpose was to identify the most promising energy storage devices and the vehicular missions for which the resultant propulsion systems are best suited. Projected costs of the vehicles are used to discuss the study's findings. Additionally, some preliminary findings concerning an assessment of the impact on energy storage device requirements of current transportation developments and trends are discussed.

18934 **Lead-acid battery expander--1. Electrochemical evaluation techniques.** Mahato, B.K. (Globe-Union Inc, Milwaukee, Wis). *Journal of the Electrochemical Society ;* **127**: No. 8, 1679-1687(Aug 1980).

The role of lignosulfonate constituent of the lead-acid battery expander on the negative electrode performance is analyzed. Two quantitative electrochemical techniques have been developed to monitor the expander activities on constant current discharge and capacity maintenance behavior of the electrode during cycling. Both these techniques are based on small electrodes and proved effective in evaluating expander candidate materials outside the test battery. Test results agree closely with the reported expander's influence on the pasted electrode. The plausible mechanisms of expander action during high rate discharge and deep discharge cycling are elucidated. 31 refs.

3304 Hybrid Systems

REFER ALSO TO CITATION(S) 18847, 18933

3305 Flywheel Propulsion

REFER ALSO TO CITATION(S) 18933

3306 Vehicle Design Factors

18935 **Mechanisms of antioxidant decay in gasoline engines: investigations of zinc dialkyldithiophosphate additives.** Korcek, S.; Mahoney, L.R.; Johnson, M.D.; Siegl, W.O. Warrendale, PA; Society of Automotive Engineers, Inc. (1981). 13p. (CONF-810206—18).

From Society of Automotive Engineers international engineering congress and exposition; Detroit, MI, USA (23 Feb 1981).

Selected engine oils and zinc dialkyldithiophosphate additive concentrates have been added to used oils in various engines and subjected to engine testing. Oil samples obtained as a function of mileage accumulation have been analyzed using the peroxy radical titration method and ^{31}P NMR. The engine studies were supplemented by laboratory investigations of antioxidant behavior of pure neutral and basic zinc dialkyldithiophosphates, dialkyldithiophosphoric acid, tetraalkylthioperoxydiphosphate (disulfide), and of neutral zinc dialkyldithiophosphate in combination with a hindered phenol antioxidant, 4,4'-methylenebis(2,6-di-tert-butylphenol). These investigations included studies of the effects of hydroperoxides and hydrocarbon oxidation products on the radical scavenging activity of the above compounds. The results obtained from engine and laboratory studies were used to assess the role and chemical changes of zinc dialkyldithiophosphate additives in radical scavenging processes in the engine.

18936 **Multigrade gear lubricants in truck fleet testing: analysis for fuel-economy effects.** Stambaugh, R.L.; Galluccio, R.A.; Koller, R.D. Warrendale, PA; Society of Automotive Engineers, Inc. (1981). 11p. (CONF-810206—19).

From Society of Automotive Engineers international engineering congress and exposition; Detroit, MI, USA (23 Feb 1981).

The use of specially formulated engine oil is now an acceptable means of increasing the fuel efficiency of a vehicle. In principle, many of the same arguments used to justify their performance can also be applied to gear lubricants. Viscometrics and shear stability are discussed as they pertain to proper polymer selection for gear lubricant service. The fuel efficiency effects for three experimental lubricants relative to a commercial SAE 90 grade fluid were determined from a 3.1 million mile (5.0 million km) fleet test involving heavy duty trucks in normal service. The statistical techniques used to design this fleet test and analyze the data are pre-

sented, and the physical interpretation of the results is discussed. The results show that use of properly selected multi-grade gear lubricants can result in significant reduction in fuel consumption.

18937 **Rolling-resistance measurements with a piezo-electric measuring system.** Dijks, A. Warrendale, PA; Society of Automotive Engineers, Inc. (1981). 14p. (CONF-810206—23).

From Society of Automotive Engineers international engineering congress and exposition; Detroit, MI, USA (23 Feb 1981).

Rolling resistance of tires has become an important factor in the energy system of an automobile. To reduce the rolling resistance forces of tires it is necessary to have a measuring system capable to distinguish small differences due to small variations in the tire itself and due to varying usage conditions. The Delft Vehicle Research Laboratory has designed and built a measuring system based on piezo electric multi component force transducers. The system has been mounted as a fifth wheel in a frontwheel driven car and may be used either in the laboratory or on the road. Results of measurements are presented for one representative steel belted radial tire type and influences of load, speed, inflation, toe-in, camber and tread depth are given. During the measurements the tread surface temperature, shoulder temperature, and inflation rise are registered. To indicate the meaning of differences in rolling resistance, the relation to the fuel consumption of a midsize European car is reported.

18938 **Contained air flow in a radial tire.** Schuring, D.J.; Skinner, G.T.; Rae, W.J. Warrendale, PA; Society of Automotive Engineers, Inc. (1981). 10p. (CONF-810206—24).

From Society of Automotive Engineers international engineering congress and exposition; Detroit, MI, USA (23 Feb 1981).

Internal heat transfer through the tire cavity from the tire to the rim is strongly influenced by the speed distribution of the cavity air. For lack of any experimental data, exploratory tests with a hot-wire anemometer were performed on a radial tire operated at various loads, speeds, and inflation pressures. The measurement technique is described, and some results are presented. Cavity air flow is governed by the peristaltic action of the footprint region; however, it is strongly modified by secondary flows. The general speed distribution is very stable, with a peak at the leading edge of the footprint and a near-zero minimum at the tire top. Peak speeds of about 30% of the tire road speed were measured. These high speeds together with the augmenting effects of secondary flows may produce internal heat transfer coefficients well comparable with those at the outer surface.

18939 **More-effective rotary shaft seals through energy saving.** Otto, V. Warrendale, PA; Society of Automotive Engineers, Inc. (1981). 8p. (CONF-810206—25).

From Society of Automotive Engineers international engineering congress and exposition; Detroit, MI, USA (23 Feb 1981).

The power loss of a rotary shaft seal influences the endurance lifetime. It is determined in particular by the radial force, an important feature of rotary shaft seals. Decreasing radial force results in increased endurance life by reducing power loss and self-heat-generation. The comparison of seals from 1940, with those of 1980 shows the success which has been achieved as well as the possibilities for the future. The measures for the reduction of power loss have been included.

18940 **Use of waste heat for automotive air conditioning.** Hamner, R.M. Warrendale, PA; Society of Automotive Engineers, Inc. (1981). 13p. (CONF-810206—26).

From Society of Automotive Engineers international engineering congress and exposition; Detroit, MI, USA (23 Feb 1981).

The ejector-compression refrigeration system, a heat powered system which can be operated as a heat pump, is described. The operation of the system is discussed in general and the ejector itself is described in more detail. The central thrust of the paper is the application of the system to comfort air conditioning of automobiles. The advantages, limitations, and recommendations for future research and development are given. Several analyses of the theoretical cycle are made and equations describing the operation of the ejector are derived. A brief bibliography is listed.

18941 **Effects of tire inflation pressure on passenger-car fuel consumption.** Grugett, B.C.; Reineman, M.E.; Thompson, G.D. Warrendale, PA; Society of Automotive Engineers, Inc. (1981). 11p. (CONF-810206—27).

From Society of Automotive Engineers international engineering congress and exposition; Detroit, MI, USA (23 Feb 1981).

Measurements of passenger car fuel consumption at different tire inflation pressures were recently conducted. These measurements were obtained from a vehicle operated on a test track using transient driving cycles and over a range of ambient conditions. The observed changes in fuel consumption, 0.33%/psi, should therefore be representative of actual driving conditions. Subsequently, tire inflation data from 2000 vehicles in six cities were analyzed to determine the extent of passenger car tire underinflation. These data sources were then combined to estimate the nationwide excess fuel consumption, about 600 million gal/y, due to tire underinflation.

18942 **Optimization of a continuously variable transmission with emission constraints.** Radtke, R.R.; Unnewehr, L.E.; Freedman, R.J. Warrendale, PA; Society of Automotive Engineers, Inc. (1981). 11p. (CONF-810206—29).

From Society of Automotive Engineers international engineering congress and exposition; Detroit, MI, USA (23 Feb 1981).

An optimization technique was developed which can be used to compute the optimal control strategy for an engine-continuously variable transmission (CVT) configuration subject to emission constraints. The engine/CVT system is represented as a function of the four independent variables: spark advance, air/fuel ratio, exhaust gas recirculation percentage, and CVT gear ratio. The Generalized Lagrange Multiplier Technique is used to optimize these variables at a set of drive shaft torque/speed points which represent operation of the vehicle over a drive cycle. Results are presented for idealized CVT's.

18943 **Modeling the thermal state of tires for power loss calculations.** Browne, A.L.; Arambages, A. Warrendale, PA; Society of Automotive Engineers, Inc. (1981). 13p. (CONF-810206—10).

From Society of Automotive Engineers international engineering congress and exposition; Detroit, MI, USA (23 Feb 1981).

A combined thermo-mechanical model has been developed to aid in reducing tire power loss. The thermal analysis portion of this tire power loss model is the subject of this paper. A brief overview is first given of existing tire power loss thermal models. The present thermal analysis is then described in detail. It provides solutions to the basic equation of heat transfer within the tire structure and to its surroundings. The solutions are obtained by interpolating between an array of solutions that has been previously generated by use of the finite element nonlinear thermal analysis and stored in a data base. Required experimental inputs are detailed. Examples demonstrating the accuracy of this interpolation scheme are then presented. Conclusions reached are that: interpolation between an array of previously obtained solutions is a viable computational method for determining the thermal state of tires; and by interpolation, cost and time of the computer analysis are reduced while accuracy is maintained.

18944 **Tire rolling resistance and vehicle fuel consumption.** Thompson, G.D.; Reineman, M.E. Warrendale, PA; Society of Automotive Engineers, Inc. (1981). 11p. (CONF-810206—11).

From Society of Automotive Engineers international engineering congress and exposition; Detroit, MI, USA (23 Feb 1981).

Tires have a very significant effect on the fuel consumption of a vehicle; consequently both SAE and EPA have developed test procedures for a laboratory measurement of the energy dissipation characteristic of tires. This paper demonstrates a good correlation between the tire rolling resistance coefficients of three radial and one bias-ply tire and the fuel consumption of vehicles when equipped with these tires. A change of 0.001 in the tire rolling resistance coefficient resulted in an average fuel consumption effect of 2.2 cc/km on the EPA urban cycle and 1.5 cc/km on the highway cycle. In general, a 10% change in the rolling resistance coefficient resulted in a 2% change in the vehicle fuel consumption.

18945 Fuel-efficient motor oil for Japanese passenger cars. Hamaguchi, H.; Maeda, Y.; Maeda, T. Warrendale, PA; Society of Automotive Engineers, Inc. (1981). 25p. (CONF-810206—12).

From Society of Automotive Engineers international engineering congress and exposition; Detroit, MI, USA (23 Feb 1981).

A series of bench engine tests and field trials have been carried out using Japanese domestic engines and vehicles. Various motor oil viscosity grades were evaluated in order to select the best for fuel savings. A laboratory evaluation to assess friction behavior and antiwear properties was used to select suitable friction modifiers for formulating fuel saving motor oils. In general, higher oil consumption was obtained with lower viscosity oils. In some cases piston and bearing seizure occurred under severe operating conditions. Valve train wear performance of the lubricant appeared to depend mainly on the additive type used. From these experimental studies, it was determined that a viscosity grade of 7.5W-30 was best for fuel efficiency, engine performance and durability in current Japanese vehicles. Fuel efficiency was further improved by incorporating an organic Molybdenum compound as a friction modifier in the formulation.

18946 Lubricant performance in passenger-car turbochargers. Keller, J.A.; Lowther, H.V.; Rogers, T.W. Warrendale, PA; Society of Automotive Engineers, Inc. (1981). 15p. (CONF-810206—15).

From Society of Automotive Engineers international engineering congress and exposition; Detroit, MI, USA (23 Feb 1981).

Turbocharging of gasoline-powered passenger car engines, to provide improved performance while maintaining good overall fuel economy, has been adopted by some US and overseas builders. The high temperatures encountered in turbochargers can seriously affect the engine oil life. Under certain severe operating conditions excessive oil degradation deposits can be formed in the turbochargers which can lead to bearing failure. A vehicle chassis-rolls test procedure was developed to evaluate lubricant composition effects on turbocharger deposits and bearing condition. Evaluations of a number of different engine oils have demonstrated superior performance for one class of synthetic oil over high-quality mineral oils in lubricating the high-temperature areas of passenger car turbochargers.

18947 Testing of engine oils having carryover fuel-economy effects. Waddey, W.E.; Deane, B.C.; Shaub, H.; Carley, R.A. Warrendale, PA; Society of Automotive Engineers, Inc. (1981). 11p. (CONF-810206—16).

From Society of Automotive Engineers international engineering congress and exposition; Detroit, MI, USA (23 Feb 1981).

Evaluation of the fuel economy characteristics of engine oils requires a rigorous test design. Side-by-side test designs, though adequate for evaluating the control of deposits, wear, and viscosity, require too many cars for precise fuel-economy testing. Crossover, Latin-square, and other balanced-block designs cannot be used if the fuel economy oil shows carryover effects; that is, if the engine is conditioned by the fuel economy oil so that subsequent oils still show a residual fuel economy benefit. The most suitable test design is a sequential one. The reference oil is run until it demonstrates a constant level of fuel economy. The test oil is then run for enough miles so that its full effect has been reached. The comparison is made between the two stabilized levels. Examples are given for an SAE 10W-40, API SF oil, which showed a 4 + % fuel economy improvement in both fleet and EPA type chassis-dynamometer sequential-design tests. A deconditioning oil technology is currently being evaluated. The fuel economy of a vehicle is determined on a reference oil and a fuel economy oil in a sequential manner. The vehicle is then run for a short period on the deconditioning oil, which removes any friction-reducing films from the rubbing surfaces, and restores the engine to its original reference oil fuel economy level. If successful, this deconditioning technology will greatly reduce the time and cost of fuel economy testing.

3307 Emission Control

REFER ALSO TO CITATION(S) 18923, 18950

18948 Fuel economy and exhaust emissions relationships for low- and high-mileage California automobiles. Appleby, M.R.; Bintz, L.J.; Hodge, B.E. Warrendale, PA; Society of Automotive Engineers, Inc. (1981). 10p. (CONF-810206—22).

From Society of Automotive Engineers international engineering congress and exposition; Detroit, MI, USA (23 Feb 1981).

Fuel shortages in recent years have heightened interest in the relationship of vehicle fuel economy to the control of exhaust emissions. To determine if, with accumulation of mileage, changes in exhaust emissions are accompanied by changes in fuel economy, both were measured on relatively large displacement, domestic 1976 to 1978 production vehicles at low mileage (0 to 15,000 miles) and at high mileage (40,000 to 60,000 miles). An analysis of the data indicates that there is a relationship between fuel economy and two of the three exhaust pollutants measured. The changes in fuel economy and exhaust emissions as well as the relationship between them are described in detail.

18949 Comparison of the emissions of polynuclear aromatic hydrocarbons from automobiles using gasoline or a methanol/gasoline blend. Stenberg, U.; Alsberg, T.; Bertilsson, B.M. Warrendale, PA; Society of Automotive Engineers, Inc. (1981). 9p. (CONF-810206—8).

From Society of Automotive Engineers international engineering congress and exposition; Detroit, MI, USA (23 Feb 1981).

Individual polynuclear aromatic hydrocarbons (PAH) were measured in the exhaust gas from gasoline and gasoline/methanol blend fueled vehicles. Driving cycle tests as well as constant speed conditions were used. Exhaust emission samples were collected on filters together with a condenser. Eleven PAHs were quantified by gas chromatography and FID. PAHs in the fuels were also determined. There was no consistent difference in the amount of PAH-emission when the two fuels, gasoline and the gasoline/methanol blend, were compared. The emissions contain specific PAHs that cannot be found in the fuel.

3308 Alternative Fuels

REFER ALSO TO CITATION(S) 18923, 18949

18950 Impact of gasohol on automobile evaporative and tailpipe emissions. Lang, J.M.; Black, F.M. Warrendale, PA; Society of Automotive Engineers, Inc. (1981). 13p. (CONF-810206—28).

From Society of Automotive Engineers international engineering congress and exposition; Detroit, MI, USA (23 Feb 1981).

National interest is growing in the use of gasohol, a blend of ethanol and unleaded gasoline, as an alternate fuel to gasoline. In order to assess its viability as a transportation fuel, gasohol's impact on vehicle emissions, fuel economy, and driveability must be considered, along with the cost of production and the physical compatibility of ethanol with gasoline. Both tailpipe and evaporative emissions were examined on two passenger cars, a 1977 Ford Mustang II and a 1979 Ford LTD II. In addition to determining total hydrocarbon, ethanol, carbon monoxide and nitrogen oxides content, fuel economy and driveability were also examined. The procedures used for emissions measurement are described in the Federal Register for LDV Certification. Five fuels were used in the program, including two base fuels and three gasohol blends, each car tested with the fuels in sequential order. Generally, the addition of ethanol to gasoline reduced tailpipe emissions of hydrocarbons and carbon monoxide, but increased emissions of nitrogen oxides. Since the stoichiometric air/fuel (A/F) ratio for ethanol is lower than that for gasoline, adding ethanol to gasoline results in a lean shift in combustion stoichiometry, which generally results in a decrease of hydrocarbons and carbon monoxide emissions and an increase in oxides of nitrogen emissions. Coldstart driveability problems were experienced with the LTD II. Little change in fuel economy was observed with either vehicle. The use of gasohol substantially increased the evaporative emissions of both vehicles. Two final areas

examined during this program were the adequacy of a one hour test period for determination of hot soak evaporative emissions and the sensitivity of the emissions to vehicle preconditioning. Hot soak evaporative emissions increased during the second hour of examination and both tailpipe and evaporative emissions were sensitive to vehicle preconditioning.

18951 **Contra Costa County's one-year experience with gasohol.** Gibbs, L.M.; Gilbert, B.J. Warrendale, PA; Society of Automotive Engineers, Inc. (1981). 19p. (CONF-810206—14).

From Society of Automotive Engineers international engineering congress and exposition; Detroit, MI, USA (23 Feb 1981).

Starting August 1, 1979, a one-year gasohol test was conducted by Contra Costa County. A total of 30 county pool cars were on test - 15 on gasohol and 15 similar cars on gasoline as a control group. Findings were as follows. There were no fuel-related maintenance problems in either the gasohol or gasoline groups of cars. Cool weather driveability for the gasohol cars was the same or better than gasoline cars. No vapor lock or other hot driveability problems were reported for either fuel. Fuel economy of the gasohol cars was about 5% poorer than that of the gasoline cars. Fuel system deposits with gasohol were increased and differed in character compared to gasoline. Also, the gasohol carburetors showed more inlet needle valve tip wear. However, to date, the observed deposits and wear with gasohol have not caused any apparent problems.

36 MATERIALS

18952 (DOE/SF/10538—T8(Vol.2), pp 272-288) **Materials & lower priority technologies.** Mar 1981. NTIS, PC A08/MF A01.

In Studies on advanced overseas energy technologies. Volume II. Final report.

A review of work underway in overseas countries on materials and lower priority technologies varied from bibliographic studies through solid state matter investigations to actual demonstrations, from cryogenic temperatures to 5000°C and covers combustion chambers from boilers to incinerators, as well as internal and external combustion engines. Reports are included from Italy, Norway, Federal Republic of Germany, Japan, UK, Switzerland, Sweden, France, Belgium, and Netherlands. (MCW)

3601 Metals And Alloys

REFER ALSO TO CITATION(S) 17907, 17908, 18033, 18085, 18267, 18536, 18588, 18588, 18589, 18796, 18878, 18878, 18985, 19000, 19508, 19544

18953 **(BDX—613-2543) Aluminum alloy welding and stress-corrosion testing. Final report.** Gates, W.G.; Jimenez, E. (Bendix Corp., Kansas City, MO (USA)). Apr 1981. Contract AC04-76DP00613. 34p. NTIS, PC A03/MF A01.

The weldability, strength, and corrosion resistance of four 5XXX aluminum alloys electron beam welded to 6061-T6 aluminum alloy without a filler metal were evaluated. Adding filler metal raises weld energy requirements and makes the process more difficult to control. In this study, instead of using a filler metal, a high-magnesium 5XXX alloy was welded to the 6061 alloy. The four 5XXX alloys used (5456-H321, 5052-H34, 5086-H323, and 5083-H32) were selected for their high magnesium content which reduces weld crack sensitivity.

18954 **(BNL—29058) Thermodynamic and electronic properties of liquid Na-Bi alloys.** Pfeiffer, H.P.; Heus, R.J.; Egn, J.J. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 12p. (CONF-810203—8). NTIS, PC A02/MF A01.

From AIME annual meeting; Chicago, IL, USA (22 Feb 1981).

The electrical conductivity of liquid Na-Bi alloys was measured between 850°C and 900°C for mole fractions of Na between 0.70 and 0.80. The behavior shows that Na/sub 3+δ/Bi is a liquid compound semiconductor. The Gibbs energy of mixing was also measured at 850°C over the same composition range using a boiling point tehnique and an emf technique with CaF_2 as a solid electrolyte. Results were interpreted in terms of a simple model of Carl Wagner. The analysis yields the number of conduction electrons and electron holes as a function of composition as well as the mobility of electrons and electron holes.

18955 **(CONF-800544—3) Atom-probe field-ion-microscopy study of Fe-Ti alloys.** Pickering, H.W.; Kuk, Y.; Sakurai, T. (Pennsylvania State Univ., University Park (USA)). 1980. Contract AC02-79ER10430. 4p. NTIS, PC A02/MF A01.

From Electrochemical Society meeting; St Louis, MO, USA (11 May 1980).

A newly developed high-performance atom-probe (field ion microscope) was employed for the composition analysis of Fe-Ti alloys and their interactions with ambient gas, such as H_2 and O_2. With a mass resolution ($m/\Delta m$) better than 2000 and a spatial resolution of a few A, all isotopes of Fe and Ti and their hydrides and other compounds are clearly resolved during the depth profile study. Some of our findings are: (1) Titanium segregated on the surface and grain boundaries upon heating (≧ 900°C), in the form of oxides, and (2) some Ti in the bulk forms clusters of various sizes with C, O, and/or N as nuclei.

18956 **(CONF-8006158—2) EXAFS studies of the local atomic environment in metal-metal glasses.** Wong, J.; Lytle, F.W.; Liebermann, H.H.; Tanner, L.E. (General Electric Co., Schenectady, NY (USA). Corporate Research and Development Dept.; Boeing Co., Seattle, WA (USA); Manlabs, Inc., Cambridge, MA (USA)). 1980. Contract AC02-79ER10382. 7p. NTIS, PC A02/MF A01.

From Conference on metallic glasses: science and technology; Budapest, Hungary (Jun 1980).

The interatomic distances and nearest neighbor coordinations of constituent atoms in a series of metal-metal glasses: M′/sub 100-x/M″/sub x/ where M′ = Zr, Nb, M″ = Fe, Ni, Cu and x varies from 30 to 60 at %, have been determined using the EXAFS technique in conjunction with the x-ray synchrotron source at Stanford. Fourier transforms of the EXAFS signals clearly indicate there are like as well as unlike atom pairs in the first coordination shell about both the M′ and M″ atoms. The ratio of like and unlike pairs scales linearly with composition and is indicative of random mixing in these binary glasses. The M′-M″ separation are shorter than sum of the Goldschmidt radii and implies chemical interaction between the M′ and M″ atoms.

18957 **(DOE/ER/01198—1346) Diffusion of hydrogen, deuterium, and tritium in niobium.** Matusiewicz, G.R. (Illinois Univ., Urbana (USA). Dept. of Metallurgy and Mining Engineering). 1981. Contract AC02-76ER01198. 179p. NTIS, PC A09/MF A01.

Thesis.

The diffusion of hydrogen in niobium was investigated over the temperature range 148 to 500 degrees Kelvin, using measurements of the elastic after effect caused by long range diffusion (the Gorsky Effect). Relaxation curves for pure annealed niobium were generally not of the single exponential form expected from the Gorsky Effect theory, but were described well by a sum of two exponential curves with different amplitudes and relaxation times. The effects of oxygen and nitrogen interstitials on the diffusion were studied and were not in agreement with conventional trapping models. Deuterium and tritium diffusion in niobium were also studied, and a non-classical isotope effect was observed. Hydrogen diffusion coefficients in several Nb-Ta alloys were measured, and the diffusivity in all these alloys exhibited a non-Arrhenius temperature dependence. Experimental results were compared to several models for diffusion and trapping. A model is presented which can account for the form of the relaxation curves observed in pure, annealed niobium.

18958 **(DOE/ER/02029—T1) Acoustic emission signature analysis. Technical progress report No. 2, 1 March 1979-29 February 1980.** Buck, O.; Pardee, W.J. (Rockwell International Corp., Thousand Oaks, CA (USA). Science Center). Mar 1980. Contract AC03-78ER02029. 36p. NTIS, PC A03/MF A01.

Acoustic emission in plate glass and steel has been studied as a function of angle. The low frequency AE in glass (< 1 MHz) was studied in detail, and contributions from P, S and Rayleigh waves identified. These results are isotropic, as expected theoretically. Limited high frequency (5-20 MHz) results have been obtained in glass. This is the first time, that AE energy has been measured above 3 MHz. The measurement of AE on transgranular crack growth in steel during fatigue crack growth was accomplished by use of a low noise manual hydraulic loading system and an electronic gate to reject grip noise. The signals are complex, and not yet understood in detail. The concept of the wave momentum of an AE, first introduced during the previous year, was elaboratored and a measurement technique suggested. The theoretical study of this problem led to the discovery of an infinite, previously unknown, family of elastic surface (Rayleigh-like) waves, and to further cylindrical, radially propagating plate waves. It appears these waves may be useful in other areas of ultrasonics.

18959 **(DOE/NASA/2593—26) Burner-rig evaluation of thermal barrier coating systems for nickel-base alloys.** Gedwill, M.A. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). Feb 1981. Contract AI01-77ET10350. 25p. (NASA-TM—81685). NTIS, PC A02/MF A01.

Eight plasma-sprayed bond coatings were evaluated for their potential use with ZrO_2-Y_2O_3 thermal barrier coatings (TBCs) which are being developed for coal-derived-fuel-fired gas turbines. Longer TBC liver in cyclic burner rig oxidation to 1050°C were achieved with the more oxidation resistant bond coatings. These were Ni-14.1Cr-13.4A1-0.10Zr, Ni-14.1Cr-14.4A1-0.16Y, and Ni-15.8Cr-12.8A1-0.36Y on Rene 41. The TBC systems performed best when 0.015-cm thick bond coatings were employed that were sprayed at 20 kW using argon - 3.5 v/o hydrogen. Cycling had a more life limiting influence on the TBC than accumulated time at 1050°C.

18960 **(IS-T—927) Normal spectral emissivities of liquid iron, liquid nickel, and liquid iron-nickel alloys.** Ratanapupech, P. (Ames Lab., IA (USA)). 1980. Contract W-7405-ENG-82. 79p. NTIS, PC A05/MF A01.

Thesis.

The normal spectral emissivities of liquid iron, liquid nickel, and liquid iron-nickel alloys over the complete range of composition were determined at wavelength $\lambda = 645$ nm by an integral blackbody comparison method. The emissivities of constant from 1809 to 1857°K for liquid iron, from 1729 to 1823°K for liquid nickel, and from 1810 to 1890°K for liquid iron-nickel alloys. The normal spectral emissivity of liquid iron-nickel alloy is dependent on composition.

18961 **Ternary phase diagrams of the manganese-titanium-iron and the aluminum-titanium-iron systems: a comparison of computer calculations with experiment.** Dew-Hughes, D. (Brookhaven National Lab., Upton, NY); Kaufman, L. *Calphad ;* **3**: No. 3, 175-203(1979).

Computer calculation of the isothermal sections in the Mn-Ti-Fe and Al-Ti-Fe systems were carried out at 1273K by combining the previously published analytical descriptions of the Fe-Ti, Al-Ti, Fe-Al, Fe-Mn and Ti-Mn binary systems. The calculations were carried out in two steps to provide some insight into the advantages and shortcomings of the technique. Initial calculations were conducted based on assumed compound trajectories from the binary systems into the ternary systems coupled with zero values for the ternary interaction parameters of ternary phases. As a second step experimental determination of selected portions of these systems was conducted to provide a check on the initial calculations and provide a basis for refinement. The final stage comprised recalculation of these ternary systems to imrove the agreement between calculated and observed results. The final step provides some insight into the initial assumptions and also presents a rational means for extrapolating the current results to higher and lower temperatures.

18962 **(LBL—12069) Reaction behavior of zircaloy with simulated fission products.** Kohli, R. (Lawrence Berkeley Lab., CA (USA)). Jan 1981. Contract W-7405-ENG-48. 8p. (CONF-810606—23). NTIS, PC A02/MF A01.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

The investigation reported in this paper was prompted by the lack of information on the reaction behavior of Zircaloy on long-term exposure to fission product environments in the temperature range 573 - 973 K. Small Zircaloy-2 (Zircaloy-2 contains by weight 1.5% Sn; 0.15% Fe; 0.08% Cr; 0.05% Ni; rest Zr) strip specimens (ca. 25mm x 3mm x 0.75 mm thick) were exposed to various simulated fission product environments (Cs, I, Br, Cd, In, Sb, Sn, Se as vapor; all others as powders) for times to 5.4 Ms (1500 h) in the temperature range 673 - 973 K. The reaction behavior was characterized by scanning electron microscopy with an EDAX analyzer, optical metallography, and x-ray diffraction.

18963 **(NP—25310) Mechanical properties data needs in Type 316 steel for fast-reactor application.** Wood, D.S. (UKAEA Risley Nuclear Power Development Labs.). 1981. 9p. NTIS (US Sales Only), PC A02/MF A01.

The design of high temperature components has become much more sophisticated in the last decade demanding considerably more materials data. Data requirements for Type 316 steel are discussed in this paper in relation to the Commercial Demonstration Fast Reactor. Although guidance can be obtained from ASME Code Case N47, there are many areas where additional information is considered necessary. The present data position is given and areas for further work identified. Particular emphasis needs to be given to obtaining additional data on creep/fatigue, strain controlled high cycle fatigue, fracture toughness and low temperature deformation. Further information is also required on long term stress rupture, creep deformation, stress relaxation and crack growth. Although the paper is centered on the properties of solution annealed Type 316 steel, for a full design endorsement it will also be necessary to establish the effects of thermal ageing, sodium and irradiation environment and the properties of weld metal.

18964 **(SAND—80-1156) Computational and experimental analysis of a U-6w/oNb vacuum consumable arc remelted ingot. A progress report for the Sandia macrosegregation study.** Zanner, F.J.; Bertram, L.A. (Sandia National Labs., Albuquerque, NM (USA)). Apr 1981. Contract AC04-76DP00789. 115p. NTIS, PC A06/MF A01.

A computer code (ZAP) has been developed to simulate the thermodynamic, magnetohydrodynamic, and fluid flow conditions in the liquid and solid-liquid regions of a solidifying ingot during vacuum consumable arc remelting. The code is coupled and constrained with experimentally determined measurements of boundary conditions and melt parameters such as melt rate, melt current, and melt time. The work reported presents one preliminary step in the coupled experimental-numerical process. A 538 kg U-6w/oNb ingot was remelted to obtain regions of constant melting current of 2 through 6 kA in 1 kA increments. The melt was simulated numerically using inputs for the code that were obtained from this experiment. Results of this numerical simulation are compared to experimental results obtained from ingot radiography and chemical analysis.

18965 **(SAND—81-2742C) Technology of ion plating.** Mattox, D.M. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 12p. (CONF-810619—2). NTIS, PC A02/MF A01.

From American Electroplaters' Society conference; Boston, MA, USA (28 Jun 1981).

Ion plating is a generic term applied to film deposition processes in which the substrate surface and/or the depositing film is subjected to a flux of high energy particles sufficient to cause changes in the interfacial region or film properties compared to the nonbombarded deposition. The most useful properties achieved by the ion plating process are increased coating adhesion, improved coverage compared to vacuum processes and improved film properties such as lower intrinsic stress and higher density. Ion plating is generally performed in a low pressure gaseous environment and may be used to coat metal, organic or ceramic surfaces with a wide variety of adherent elemental and compound coating materials.

18966 (UCRL—53058) Cumulative-strain-damage model of ductile fracture: simulation and prediction of engineering fracture tests. Wilkins, M.L.; Streit, R.D.; Reaugh, J.E. (Lawrence Livermore National Lab., CA (USA); Science Applications, Inc., San Leandro, CA (USA)). 3 Oct 1980. Contract W-7405-ENG-48. 69p. NTIS, PC A04/MF A01.

A cumulative-strain-damage criterion is used to predict the initiation and propagation of fracture in ductile materials. The model is consistent with a model of ductile rupture that involves void growth and coalescence. Two- and three-dimensional finite difference computer codes, which use incremental-plasticity theory to describe large strains with rotation, are used to trace the history of damage in a material due to external forces. Fracture begins when the damage exceeds a critical value over a critical distance and proceeds as the critical-damage state is reached elsewhere. This unified approach to failure prediction can be applied to an arbitrary geometry if the material behavior has been adequately characterized. The damage function must be calibrated for a particular material using various material property tests. The fracture toughness of 6061-T651 aluminum is predicted.

18967 (Y/DK—246) X-ray fluorescence analysis of various alloys. Part 1. Charles, J.W. Jr.; Ferguson, M.R.; Eager, M.H. (Oak Ridge Y-12 Plant, TN (USA)). 15 Feb 1980. Contract W-7405-ENG-26. 190p. NTIS, PC A09/MF A01.

For a number of years, x-ray fluorescence spectrometry has been used in the Y-12 Plant Laboratory for the analysis of a wide variety of materials. During the past few years, the technique has been applied to the analysis of a large number of experimental alloys. The general procedure consists of the following steps: (1) ignition of the alloy to oxides, (2) addition of suitable internal standards, (3) dissolution of the oxides and internal standards by sodium tetraborate (borax) fusion, (4) casting a pellet from the fusion in a graphite mold (Figure 1), and (5) determination of the major constituents by x-ray fluorescence spectrometry.

18968 Helium trapping at Ti-rich MC particles in neutron-irradiated type 316 + Ti stainless steel. Maziasz, P.J. (Oak Ridge Natl Lab., TN). *Scripta Metallurgica ;* **14**: No. 11, 1251-1256(Nov 1980).

Recent work on type 316 + Ti stainless steel irradiated in the High Flux Isotope Reactor correlates both improvement in swelling resistance and mechanical response to the preferential accumulation of helium and its accommodation in many tiny bubbles at the interfaces of Ti-rich MC precipitate particles. MC particles formed during irradiation have been studied using quantitative analytical electron microscopy. The results are compared with Laves particles to understand the mechanism of MC-helium interfacial trapping. 40 refs.

18969 Microscopic theory of brittle fracture in deformable solids: a relation between ideal work to fracture and plastic work. Jokl, M.L.; Vitek, V.; McMahon, C.J. Jr. (Univ. of Pennsylvania, Philadelphia). Contract A502-79ER1 0429. *Acta Metallurgica ;* **28**: No. 11, 1479-1488(Nov 1980).

A criterion is developed for brittle fracture of a crystalline solid which is capable of being plastically deformed. The theory starts with the experimental fact that during extension of a brittle crack, energy is consumed not only by bond stretching and breaking, but also by dislocation emission from the crack tip. The latter is the plastic work, γ/sub p/, which in the present theory depends on the ideal work of fracture. An empirical relationship between stress and dislocation velocity is employed to calculate the work connected with dislocation emission; then an approximation of the dynamics of bond stretching is made. Combination of the two allows the development of a Griffith-type thermodynamic fracture criterion which is applicable to any deformable solid. This theory contains all the basic features of ductile vs brittle behavior of solids, regardless of whether the brittle mode is transgranular cleavage or intergranular fracture. As a consequence, a relationship between γ/sub p/ and γ is obtained which enables one to estimate γ from measurements of local fracture stress. The use of this is illustrated in the form of estimates of reductions in γ due to segregation of several impurities, calculated from measured local integranular fracture stresses in experimental steels.

18970 Mobility of hydrogen around nitrogen and oxygen trapping sites: phonon assisted tunneling parameters. Zapp, P.E.; Birnbaum, H.K. (Univ. of Illinois, Urbana). Contract EY-76-C-02-1198. *Acta Metallurgica ;* **28**: No. 11, 1523-1526(Nov 1980).

The mobility of H around O and N interstitial trapping sites has been studied in Nb using anelastic techniques. Hydrogen jump frequencies were measured in the temperature range 250 to 35°K and significant deviations from an Arrhenius temperature dependence were observed. The data were fitted to the Flynn-Stoneham phonon assisted tunneling theory and the Debye temperatures, self trapping energies, and tunneling transition frequencies were determined for the O and N traps. These values are discussed in terms of a delocalized ring model for hydrogen diffusion and are related to the distortion fields around the trapping sites.

18971 Effects of hydrogen on the creep rupture properties of Fe-Ni alloys. Schuster, G.B.A. (Univ. of Illinois, Urbana); Yeske, R.A.; Altstetter, C.J. *Metallurgical Transactions,* [*Section*] *A: Physical Metallurgy and Materials Science ;* **11**: No. 10, 1657-1664(Oct 1980).

Creep tests were run on Fe-Ni alloys with nominal compositions of 100% Ni, 75% Ni-25% Fe, 50% Ni-50% Fe, 25% Ni-75% Fe and 100% Fe. Test temperatures were 898, 1073 and 1198°K, and the stress levels ranged from 6.5 to 80.1 MPa - varying with temperature and composition. Tests were conducted in a hydrogen or helium atmosphere, and creep rates, specimen elongations and rupture lifetimes were recorded. Grain boundary sliding measurements were made on nickel specimens to determine the fraction of strain due to grain boundary sliding at rupture. An alternating atmosphere test was also conducted on nickel specimens to see if a change in test atmosphere while the test was in progress would change creep rates. Finally metallographic studies were made of the fracture surfaces of all the test specimens using a light microscope and SEM. Results of the tests showed that hydrogen reduced the creep rupture lifetime of the 100% Ni and 75% Ni-25% Fe by as much as 80%. The lower Ni alloys showed little or no effect. The alternating atmosphere test showed no change in the creep rates of the Ni specimens when the atmosphere was cycled. Grain boundary sliding measurements showed no significant difference in the fraction of total strain due to grain boundary sliding. Metallography revealed no clear differences between fracture surfaces of specimens tested in hydrogen or helium. Causes for the observed creep behavior modification are explored.

18972 Fatigue crack propagation characteristics of 2 1/4 Cr-1 Mo steel in liquid lithium at 773°K. Spencer, R.E. (Colorado School of Mines, Golden); Deweese, S.K.; Matlock, D.K.; Olson, D.L. *Metallurgical Transactions,* [*Section*] *A: Physical Metallurgy and Materials Science ;* **11**: No. 10, 1758-1761(Oct 1980).

Data are presented which show that the presence of liquid lithium enhances fatigue crack growth rates in 2 1/4 Cr-1 Mo steel at 773°K in the frequency range of 0.067 to 20 Hz by two distinct processes: stress enhanced grain boundary penetration at low frequencies and strain rate induced cleavage by liquid metal embrittlement at high frequencies.

18973 Plastic creep flow effects in the diffusive cavitation of grain boundaries. Needleman, A.; Rice, J.R. (Brown Univ., Providence, RI). Contract EY-76-02-3084. *Acta Metallurgica ;* **28**: No. 10, 1315-1332(Oct 1980).

The growth of cavities along grain interfaces is analyzed by the combined processes of grain boundary diffusion and plastic dislocation creep in the adjoining grains. It is shown that the coupling between the processes can be expressed in terms of a parameter L, which has the dimensions of length and which is a function of material properties, temperature and applied stress; L decreases with increasing temperature and stress and has, e.g., values in the range of 0.25 to 25 μm for various pure metals when stressed to 10^{-3} x shear modulus at 0.5 T/sub m/. The contribution of dislocation creep to the cavity growth rate is shown to be negligible when L is comparable to or larger than the cavity spacing, but significant interactions occur, leading to growth rates very much in excess of those predicted on the basis of boundary diffusion alone, when L is comparable to or smaller than the cavity size. The coupling occurs

because extensive dislocation creep allows local accommodation of matter diffused into the grain boundary from the cavity walls. The cavity growth rate is analyzed by formulating a new variational principle that governs combined processes of grain boundary diffusion and nonlinear viscous creep, and by implementing this principle through the finite-element method to obtain numerical solutions. Results for the cavity growth rate are presented for a wide range of ratios of L to cavity spacing, and of cavity radius to spacing. Also, results are presented for the total growth time of cavities from an initial size to final coalescence.

18974 High temperature (600 to 800°C) thermally activated deformation behavior of α-Zircaloy-4-oxygen alloys. Mehrotra, B.N.; Tangri, K. (Univ. of Manitoba, Winnipeg). *Acta Metallurgica ;* **28**: No. 10, 1385-1394(Oct 1980).

The high temperature thermally activated deformation behavior of Zircaloy-4-oxygen alloys containing oxygen up to 1 wt % has been investigated. Decremental unloading technique (Dip technique) was employed to determine the internal stress (tau/sub μ/) and thus the effective stress (tau*). Strain rate change tests were done to determine strain rate sensitivity (m) and activation volume (V*). Activation energy (ΔG/sup μ/) was calculated from the above data. Oxygen was found to produce an increase in y.s. (0.2%), tau* and ΔG_0/sup μ/ and a decrease in m and V* while tau/sub μ/ was not affected significantly. These experimental results support the view that the predominant rate controlling mechanism for deformation in this temperature regime is the thermally activated breaking of attractive junctions for these alloys. Oxygen atoms, pairs or clusters of oxygen atoms, are ruled out as barriers, instead the strengthening is attributed to an increase in the core width of the dislocations due to the presence of oxygen. This in turn results in a more stable attractive junction, which is reflected in the increasing values of ΔG_0/sup μ/ with the increase in oxygen. Finally it is suggested that the atypical temperature dependence of tau/sub μ//μ and ΔG/sup μ/ is a direct consequence of dynamic recovery.

18975 Energetic shape recovery associated with martensitic transformation in shape-memory alloys. Golestaneh, A.A. (Argonne National Lab., IL). *Acta Metallurgica ;* **28**: No. 10, 1427-1436(Oct 1980).

The present paper contains an investigation of the mechanical energy associated with the transformation of the stress-induced martensite, β′, to the parent phase, β, during the shape recovery (SR) of a deformed shape-memory (SM) material. We describe a heat-mechanical energy converter, or solid-state engine, which operates by this SR phenomenon. The energy output of such an engine is expressed in terms of a fraction α of the latent heat ΔH of the martensitic reaction. This α is found to depend on two parameters. One is the difference between the ΔH of the $\beta' \rightarrow \beta$ reaction and the ΔH of the transformation of the quench-induced martensite, γ′, to β, the other is the fraction of γ′ which can be transformed via the channel $\gamma' \rightarrow \beta' \rightarrow \beta$ instead of the direct channel $\gamma' \rightarrow \beta$. Moreover, it is shown that within certain ranges of temperature T and applied strain ε, the heat-mechanical energy balance equation leads to an expression identical in form to the Clapeyron-Clausius equation, which is usually valid for a first-order transition. Within these ε and T ranges the coefficient α is also found to be equal to log(T/sub c σ//T/sub c/) where T/sub c σ/ and T/sub c/ are the SR critical temperatures with and without the presence of an applied stress σ, respectively. We discuss the role of the γ′ martensite in this process and explain the so-called two-way SR phenomenon. In addition, the parameters that limit the output of the SR energy are evaluated. This output depends sensitively on both α and the material characteristic temperature $h = C^{-1}\Delta H$, where C is the specific heat. For a solid-state engine made with the Ni-Ti SM alloy, the efficiency is found to be limited to about 5%.

18976 Method for heat treating iron-nickel-chromium alloy. Korenko, M.K. (to Department of Energy). US Patent 4,225,363. 30 Sep 1980. Filed date 22 Jun 1978. vp.

PAT-APPL-917835.

A method is disclosed for heat treating an age-hardenable iron-nickelchromium alloy to obtain a morphology of the gamma-double prime phase enveloping the gamma-prime phase, the alloy consisting essentially of about 40 to 50% nickel, 7.5 to 14% chromium, 1.5 to 4% niobium, 0.3 to 0.75% silicon, 1 to 3% titanium, 0.1 to 5% aluminum, 0.02 to 1% carbon, 0.002 to 0.0015% boron and the remain substantially all iron. To obtain optimal results, the alloy is cold-worked 20 to 60% followed by heating at 1050°C. For 1/2 hour with an air-cool plus heating at 800°C. For 2 hours with a furnace cool to 625°C. The alloy is then held at 625°C. For 12 hours, followed by an air-cool.

18977 High strength nickel-chromium-iron austenitic alloy. Gibson, R.C.; Korenko, M.K. (to Department of Energy). US Patent 4,225,364. 30 Sep 1980. Filed date 22 Jun 1978. vp.

PAT-APPL-917834.

A solid solution strengthened Ni-Cr-Fe alloy is capable of retaining its strength at high temperatures and consists essentially of 42 to 48% nickel, 11 to 13% chromium, 2.6 to 3.4% niobium, 0.2 to 1.2% silicon, 0.5 to 1.5% vanadium, 2.6 to 3.4% molybdenum, 0.1 to 0.3% aluminum, 0.1 to 0.3% titanium, 0.02 to 05% carbon, 0.002 to 0.015% boron, up to 0.06 zirconium, and the balance iron. After solution annealing at 1038°C. For one hour, the alloy, when heated to a temperature of 650°C., has a 2% yield strength of 307 mpa, an ultimate tensile strength of 513 mpa and a rupture strength of as high as 400 mpa after 100 hours.

18978 Method of manufacturing a niobium-aluminum-germanium superconductive material. Douglas, K.E.; Pickus, M.R.; Wang, J.L. (to Department of Energy). US Patent 4,223,434. 23 Sep 1980. Filed date 1 Feb 1979. vp.

PAT-APPL-8622.

A method is discribed for manufacturing flexible Nb3 (Al,Ge) multifilamentary superconductive material in which a sintered porous niobium compact is infiltrated with an aluminum-germanium alloy and thereafter deformed and heat treated in a series of steps at different successively higher temperatures preferably below 1000°C. To produce filaments composed of Nb3(Al,Ge) within the compact. By avoiding temperatures in excess of 1000°C. During the heat treatment, cladding material such as copper can be applied to facilitate a deformation step preceding the heat treatment and can remain in place through the heat treatment to also serve as a temperature stabilizer for supeconductive material produced. Further, these lower heat treatment temperatures favor formation of filaments with reduced grain size and, hence with more grain boundaries which in turn increase the current-carrying capacity of the superconductive material.

18979 Calculation of transition temperature changes in steels due to temper embrittlement. Takayama, S.; Ogura, T.; Fu, S.C.; McMahon, C.J. Jr. (Univ. of Pennsylvania, Philadelphia). *Metallurgical Transactions,* [*Section*] *A: Physical Metallurgy and Materials Science ;* **11**: No. 9, 1513-1530(Sep 1980).

A study was made of quenched and tempered laboratory heats of 3.5 Ni-1.7 Cr steels doped with P, Sn, or Si in which the hardness, the grain size, and the extent of intergranular segregation of the metalloid dopents were varied. The segregation was accomplished by aging treatments of various times at 480°C. It was found that the increases in ductile-brittle transition temperature (ΔTT) were determined completely by the above three variables and that they can be combined in an embrittlement equation that permits the calculation of the ΔTT that will occur from a particular degree of segregation in a steel of a given hardness and grain size. The embrittlement equation contains coefficients which must be determined empirically for each type of steel and embrittling element; however, the equation is derived by a straight-forward Taylor series expansion of the TT as a function of the three variables. Each term of the resulting equation can be justified from physical considerations. The embrittlement equation can serve as a rational basis for analysis of a given type of steel or for comparisons between types. In particular, it allows one to account for variations in hardness and grain size, and to determine the benefits to be gained from control of these two factors.

18980 Thermal processing of ferritic 5Mn steel for toughness at cryogenic temperatures. Niikura, M.; Morris, J.W. Jr. (Univ. of California, Berkeley). Contract W-7405-ENG-48. *Metallurgical Transactions,* [*Section*] *A: Physical Metallurgy and Materials Science ;* **11**: No. 9, 1531-1540(Sep 1980).

It is shown that a thermal treatment which combines grain refinement with an intercritical temper (the 2BT treatment) may be used to achieve a promising combination of strength and toughness in a nickel-free ferrite steel of nominal composition Fe-5Mn-0.2Mo-0.04C at temperatures as low as -196°C. The properties achieved are attributed to a symbiotic influence between the grain refinement treatment and the introduction of thermally stable retained austenite during intercritical tempering, a conclusion supported by a comparison of the results to those obtained with simpler heat treatments. The influence of carbon, manganese, and nickel additions to the base compositions are studied. An increase in carbon content above 0.04 wt % causes a deterioration in toughness, as does an increase in manganese to 8 wt %. An addition of 1 to 3 wt % nickel is beneficial giving an increase in alloy strength at -196°C without loss of toughness. 14 figures, 4 tables.

18981 **Corrosion behaviors of Inconel 617 in hydrogen base gas mixture.** Shikama, T.; Tanabe, T.; Fujitsuka, M.; Kitajima, M.; Yoshida, H.; Watanabe, R. (National Research Inst. for Metals, Ibaraki, Japan). *Metallurgical Transactions, [Section] A: Physical Metallurgy and Materials Science ;* **11**: No. 9, 1589-1598(Sep 1980).

The corrosion behavior of Inconel 617, a candidate for the structural material of heat exchanger in the high temperature gas-cooled reactor (HTGR), has been investigated at elevated temperatures in the hydrogen base gas mixture (80% H_2 + 15% CO + 5% CO_2). This gas mixture simulates the reducing gas in the direct steel making system that uses heat from HTGR in Japan. This gas has relatively high oxidizing and carburizing potentials. In the temperature range of 650 to 1000°C Inconel 617 oxidized to form a Cr_2O_3 scale containing titanium oxide. The activation energy for this process is estimated to be 50 to 60 kcal/mol. The time dependence of the growth of the surface oxide scale was parabolic. The aluminum in Inconel 617 was internally oxidized. The time dependence of the internal oxidation was noticed to obey a 0.4 power rate law. Carburization was noticed at 650 and 900°C. At 900°C, carbides containing Si, Ti, and Mo precipitated beneath the oxide scale for gas exposure times up to 200 h. After 200 h, the formation and growth of the surface scale suppresses carburization. The thermodynamic analysis of gas atmosphere proposed by Gurry could be applied successfully to the experimental results. Some inconsistency existed mainly because of the scale formation and direct gas-metal interactions. 11 figures, 3 tables.

18982 **Interaction between the Bauschinger effect and strain aging.** Williams, D.N. (Battelle Columbus Labs., OH). *Metallurgical Transactions, [Section] A: Physical Metallurgy and Materials Science ;* **11**: No. 9, 1629-1631(Sep 1980).

When a metal is strained plastically, the yield strength in the direction opposite the direction of strain is reduced. This phenomenon is called the Bauschinger effect. During an investigation of the Bauschinger effect in HSLA steels, an interesting interaction between the Bauschinger effect and strain aging was observed. Results show that interstitial-solute strain aging can be used in certain types of steel to reduce the magnitude of the loss in yield strength on strain reversal resulting from the transient portion of the Bauschinger effect.

18983 **Temperature-dependent behavior of positron annihilation in metals.** Fluss, M.J.; Gupta, R.P.; Smedskjaer, L.C. Siegel, R.W. (Argonne National Lab., IL). *Advances in Chemistry Series ;* No. 175, 243-270(1979). (CONF-770510—P4).

From 2. joint CIC/ACS conference; Montreal, Canada (31 May 1977).

The experimental techniques used to study defects by positron annihilation spectroscopy (PAS) are described briefly. Application of th two-state trapping model (TSTM) to the extraction of monovacancy formation enthalpies, H/sub 1v/sup F/, in metals from PAS data is shown to have limitations. The parameters entering the TSTM are potentially temperature dependent, and a degree of uncertainty in these parameters is reflected in the determination of H/sub 1v/sup F/. A practical consequence of these uncertainties is a present limitation of 3 to 5% in the accuracy of PAS measurements of H/sub 1v/sup F/ in metals. Lifetime experiments yield one method by which the uncertainties in the temperature-dependent parameters of the TSTM, except for the trapping rate per unit concentration of vacancies, can be taken into account naturally. 76 references, 18 figures.

3602 Ceramics, Cermets, And Refractories

REFER ALSO TO CITATION(S) 18083, 18084, 18965

18984 **(DOE/ER/03580—T1) Improved techniques for the growth of optical-quality $CdGeAs_2$. Final report, December 1, 1976-December 31, 1977.** Feigelson, R.S.; Route, R.K. (Stanford Univ., CA (USA). Center for Materials Research). Jun 1978. Contract AS04-76ER03580. 58p. NTIS, PC A04/MF A01.

The ternary chalcopyrite compound $CdGeAs_2$ is one of the most efficient nonlinear infrared materials known. With transparency extending from 2.3 μm to 18 μm and a damage threshold exceeding 40 Mw/cm², it has a large number of potential applications, including doubling of the 10.6 μm CO_2 laser and continuous phase-matched mixing throughout its transparent region. It is also potentially suitable for certain acousto-optic applications consistent with its 4 2m space group symmetry. However, the growth of high optical quality, uncracked crystals of this material has been difficult. Polycrystallinity, cracking, and variable optical transparency were consistent problems. In this section we describe experiments carried out to eliminate (or control) polycrystallinity and cracking during the melt growth of this material.

18985 **Thermal shock resistance ceramic insulator.** Johnson, W.R.; Morgan, C.S. (to Department of Energy). US Patent 4,234,338. 18 Nov 1980. Filed date 28 Dec 1978. vp.

PAT-APPL-973846.

Thermal shock resistant cermet insulators containing 0.1-20 volume % metal present as a dispersed phase. The insulators are prepared by a process comprising the steps of (A) providing a first solid phase mixture of a ceramic powder and a metal precursor; (B) heating the first solid phase mixture above the minimum decomposition temperature of the metal precursor for no longer than 30 minutes and to a temperature sufficiently above the decomposition temperature to cause the selective decomposition of the metal precursor to the metal to provide a second solid phase mixture comprising particles of ceramic having discrete metal particles adhering to their surfaces, said metal particles having a mean diameter no more than 1/2 the mean diameter of the ceramic particles, and (C) densifying the second solid phase mixture to provide a cermet insulator having 0.1-20 volume % metal present as a dispersed phase.

18986 **Structural silicon nitride materials containing rare earth oxides.** Andersson, C.A. (to Department of Energy). US Patent 4,234,343. 18 Nov 1980. Filed date 4 Jan 1979. vp.

PAT-APPL-001033.

A ceramic composition suitable for use as a high-temperature structural material, particularly for use in apparatus exposed to oxidizing atmospheres at temperatures of 400 to 1600° C., is found within the triangular area abca of the Si3N4-SiO2-M2o3 ternary diagram depicted in fig. 1. M is selected from the group of Yb, Dy, Er, Sc, and alloys having Yb, Y, Er, or Dy as one component and Sc, Al, Cr, Ti, (Mg + Zr) or (Ni + Zr) as a second component, the alloy having an effective ionic radius less than 89

18987 **Calcium aluminosilicate glass corrosion by phosphoric acid.** Thakore, N.C.; Rockett, T.J. (Univ. of Rhode Island, Kingston). *American Ceramic Society Bulletin ;* **59**: No. 11, 1122-1123(Nov 1980).

The corrosion rates of a series of calcium aluminosilicate and sodium calcium aluminosilicate glasses were determined in three phosphoric acids at several temperatures. The effect of temperature on corrosion rate was determined for one glass in 30 wt % H_3PO_4; an activation energy was determined as well. The glasses are virtually insoluble at silica concentrations of >55 wt % SiO_2 and show extreme solubility at silica concentrations <50 wt %. At the trsnsition composition, a silica-gel layer is formed on the surface.

18988 Controlling the oxygen content of Si_3N_4 powders. Greskovich, C.; Palm, J.A. (General Electric Co., Schenectady, NY). Contract EC-76-A-1017. *American Ceramic Society Bulletin ;* **59**: No. 11, 1155-1156(Nov 1980).

The weight gain and the corresponding O content of the Si_3N_4 powder increase with increasing oxidation time at 1000°C. The oxidation kinetics follow approximately parabolic behavior, with as much as 3.5 wt % oxygen acquired after 5 h.

18989 Stoichiometry effects on the fracture of TiO/sub 2-x/. Minnear, W.P.; Bradt, R.C. (Pennsylvania State Univ., University Park). Contract EY-76-S-02-3420. *Journal of The American Ceramic Society ;* **63**: No. 9/10, 485-490(Sep 1980).

From 77. annual meeting of the American Ceramic Society; Washington, DC, USA (6 May 1975).

Fracture characteristics of TiO/sub 2-x/ were studied as a function of stoichiometry. With increasing x, the fracture toughness K/sub Ic/ and the fracture surface energy γ/sub f/ decrease and the amount of transgranular cleavage increases, corresponding to the increased concentration of planar defects within the grains. Increasing nonstoichiometry also shifted the K/sub I/-V) diagram to lower K/sub I/ values, commensurate with the K/sub Ic/ decrease. Water accelerated stress corrosion by promoting intergranular failure during subcritical crack growth.

18990 Crystallization of nuclear waste disposal glass. Boulos, E.N.; DePaula, R.P.; El-Bayoumi, O.H.; Lagakos, N.; Macedo, P.B.; Moynihan, C.T.; Rekhson, S.M. (Catholic Univ. of America, Washington, DC). Contract ER-78-S-05-5781. *Journal of The American Ceramic Society ;* **63**: No. 9/10, 496-501(Sep 1980).

The rate of bulk crystallization and shear viscosity eta of a zinc borosilicate simulated nuclear waste disposal glass (SNWDG) were measured above the glass transition temperature T/sub g/. Using recent theories and experimental data for the temperature dependence of eta at $<$T/sub g/, the crystallization rate below T/sub g/ was calculated; well below T/sub g/ the SNWDG (and, more generally, any high-silica glass) will not crystallize appreciably over any important time period for radioactive decay of fission products.

18991 Role of grain-boundary sliding in fracture of hot-pressed Si_3N_4 at high temperatures. Tsai, R.L.; Raj, R. (Cornell Univ., Ithaca, NY). Contract EG-77-S-02-4386. *Journal of The American Ceramic Society ;* **63**: No. 9/10, 513-517(Sep 1980).

From Basic Science and Nuclear Divisions fall meeting, the American Ceramic Society; Hyannis, MA, USA (27 Sep 1977).

A new type of internal friction experiment was used to investigate the kinetics of grain-boundary sliding in hot-pressed Si_3N_4. The measured sliding resistance in NC-132 was greater than HS-110 and HS-130 materials.

18992 Investigation of grain-boundary segregation in ceramic oxides by analytical scanning transmission electron microscopy. Bender, B.; Williams, D.B.; Notis, M.R. (Lehigh Univ., Bethlehem, PA). Contract EY-76-5-02-2408. *Journal of The American Ceramic Society ;* **63**: No. 9/10, 542-546(Sep 1980).

From 81. annual meeting of the American Ceramic Society; Cincinnati, OH, USA (1 May 1979).

Analytical scanning transmission electron microscopy (AEM) was used to study grain-boundary solute segregation in the systems MgO-NiO, Al_2O_3, NiO-Cr_2O_3, and NiO-Al_2O_3. Electron beam spreading within the specimen was incorporated into a model to quantitatively measure solute segregation. Grain-boundary segregation occurred in Al_2O_3-Y_2O_3 and NiO-Cr_2O_3 but was not detected in MgO-NiO and NiO-Al_2O_3 specimens. These results and the quantitative measurements agree with equilibrium solute segregation theories. Microhardness measurements indicate no difference in hardness between the grain boundary and the matrix for Cr-doped NiO, a system in which segregation was detected.

18993 Kinetics of surface-layer formation on simulated nuclear waste glass. Pickering, S. (Commission of the European Communities, Karlsruhe, Germany). *Journal of The American Ceramic Society ;* **63**: No. 9/10, 558-562(Sep 1980).

Waste glass immersed in water at high temperatures and pressures rapidly develops a surface layer. The growth of this layer was followed semiquantitatively using an optical interference technique. Growth rates were measured as a function of temperature and pressure in distilled water and 1% NaCl solution. Pressures of 25 to 85 x 10^5 Pa had no measurable effect at 200°C on glass immersed in water. At a pressure of 25 x 10^5 Pa the growth rate increased with temperature in both water and salt solution. The rates were described in terms of activation energies (83.4 kJ/mol for water and 53.0 for salt solution) with approximately equal rates in both solutions at 240°C. The rates of growth were linear in all cases. The surface layer began to exhibit cracks when its thickness exceeded $\cong$ 2.5 μm and it eventually spalled.

18994 Grain-boundary diffusion of ^{60}Co and ^{51}Cr in NiO. Chen, W.K.; Peterson, N.L. (Argonne National Lab., IL). *Journal of The American Ceramic Society ;* **63**: No. 9/10, 566-570(Sep 1980).

From 79. annual meeting of the American Ceramic Society; Chicago, IL, USA (26 Apr 1977).

Grain-boundary diffusion of ^{60}Co and ^{51}Cr in bicrystals and polycrystals of NiO was measured at temperatures $<$0.6 T/sub m/ at various equilibrium oxygen partial pressures, using a tracer-sectioning technique. Values of D'δ were obtained using the Whipple and Suzuoka analyses. The results show that, for both ^{60}Co and ^{51}Cr, grain-boundary-enhanced diffusion is observed and the temperature dependence of D'δ is about the same as that of the respective bulk diffusivity, D. The effects of equilibrium oxygen partial pressure and the type of grain boundary on D'δ are not detectable within experimental error.

18995 Anomalous solid-particle erosion rate of hot-pressed silicon carbide. Routbort, J.L.; Scattergood, R.O. (Argonne National Lab., IL). Contract W-31-109-ENG-38. *Journal of The American Ceramic Society ;* **63**: No. 9/10, 593-595(Sep 1980).

The steady-state erosion rate of a commercial hot-pressed SiC was investigated using angular Al_2O_3 particles. An anomalous size dependence was observed which may be due to grain boundries. (DLC)

18996 Superconductivity of some transition metal compounds. Christensen, A.N.; Rasmussen, S.E.; Thirup, G. (Aarhus Univ., Denmark). *Journal of Solid State Chemistry ;* **34**: No. 1, 45-50(Aug 1980).

Single crystals of niobium carbonitride were made by zone melting growth methods and single crystals of γ-NBN and δ-NbN by zone annealing crystal growth. The crystals are nonstoichiometric in contrast to the niobium carbonitride or niobium nitride prepared in reaction with nitrogen gas and niobium-niobium carbide mixtures and niobium metal, respectively. The transition temperature for superconductivity (T/sub c/) decreases with increasing deviation from stoichiometry, and a determination of T/sub c/ is a nondestructive determination of this deviation. An instrument using the Wheatstone bridge principle is described and T/sub c/ values are listed for some nonstoichiometric single crystals of niobium carbonitride and niobium nitride.

18997 Electron microscopy study of crystallography and phase relationships in the Be_3N_2-$BeSiN_2$ system. Shaw, T.M.; Thomas, G. (Univ. of California, Berkeley). *Journal of Solid State Chemistry ;* **33**: No. 1, 63-82(Aug 1980).

Transmission electron microscopy and diffraction have been used to examine structural aspects of phases along the $BeSiN_2$-Be_3N_2 tie line of the Be-Si-O-N system. Electron diffraction experiments are found to substantiate previous x-ray evidence for the derived structures of $BeSiN_2$,β-Be_3N_2, and α-Be_3N_2 and the presence of a number of long-period superstructures at intermediate compositions. Real space observations using direct fringe and structure imaging techniques have been made and are in agreement with the 15R polytype structure derived from x-ray diffraction data. This structure is composed of coherent intergrowths of $BeSiN_2$ and β-Be_3N_2. Further observations made on a nonstoichiometric $BeSiN_2$ sample suggest that the polytypes may be described in terms of a regularly faulted $BeSiN_2$ structure. Each fault changes the coordination of tetrahedral sites from base sharing to edge sharing in the

fault, allowing excess beryllium atoms to be accommodated in the close-packed nitrogen lattice. For larger deviations from the $BeSiN_2$ stoichiometric composition, a higher denstiy of faults occur which interact to form ordered arrangements and the observed polytype structures. The present observations established that polytypism in the Be-Si-N system is related to the general phenomenon of crystallographic shear as observed in other complex oxide and ceramic systems. It is suggested that similar faulting may account for the polytype structures in other sialon systems.

18998 **Model for ionic hopping in Li_3N.** Richards, P.M. (Sandia Labs., Albuquerque, NM). *Journal of Solid State Chemistry ;* **33**: No. 1, 127-130(Aug 1980).

Analysis of published NMR relaxation data of ^6Li and ^7Li in Li_3N leads to a unique model fo Li^+ hopping along the c-axis. It is one in which an ion goes directly from one Li(1) plane to another Li(1) plane by passing through the intermediate Li(2) plane.

3603 Composite Materials

18999 **(COO—4440-8) Moisture penetration into composites under external stress.** Marom, G.; Broutman, L.J. (Illinois Inst. of Tech., Chicago (USA)). 1981. Contract AS02-77ER04440. 6p. (CONF-810242—1). NTIS, PC A02/MF A01.

From 36. annual conference of the reinforced plastics/composites institute; Washington, DC, USA (16 Feb 1981).

Moisture penetration at 95°C into glass fibre and graphite fibre-reinforced epoxies is examined in stressed and unstressed materials. The study focuses on the effect of the angle between the stress and the fibre directions on the diffusivities. It is found that the consequence of applying external stresses to composites is an increase in their rate of moisture absorption, their maximum moisture content, and in the diffusion coefficients. As the angle between the loading and fibre directions is increased the rate and the maximum value of moisture absorption also increase. Their ratio, however, remains constant resulting in loading angle independence of the diffusion coefficients. The results also indicate that the exposure of the composites to water produces a typical damage mechanism which enhances moisture take-up.

19000 **Materials 1980.** Azusa, CA; SAMPE National Business Office (1980). 1150p. (CONF-801010—).

From 12. National Society for the Advancement of Materials and Process Engineering technical conference; Seattle, WA, USA (7 Oct 1980).

Of the papers presented, three have been previously input to the data base and a separate abstract was prepared for one paper to be added to the data base. The paper abstracted concerns the design and fabrication of composite material blades for large wind turbines.

3604 Polymers And Plastics

REFER ALSO TO CITATION(S) 18834

3606 Other Materials

REFER ALSO TO CITATION(S) 18254, 18258, 18260, 18260, 18272, 18273, 18275, 18279, 18284, 18834, 19428, 19507

19001 **(CONF-810446—1(Draft)) Melting phenomenon and laser annealing in semiconductors.** Narayan, J. (Oak Ridge National Lab., TN (USA)). Mar 1981. Contract W-7405-ENG-26. 13p. NTIS, PC A02/MF A01.

From 2. Oxford conference on microscopy of semiconducting materials; Oxford, UK (6 Apr 1981).

The work on annealing of displacement damage, dissolution of boron precipitates, and the broadening of dopant profiles in semiconductors after treating with ruby and dye laser pulses is reviewed in order to provide convincing evidence for the melting phenomenon and illustrate the mechanism associated with laser annealing. The nature of the solid-liquid interface and the interface instability during rapid solidification is considered in detail. It is shown that solute concentrations after pulsed laser annealing can far exceed retrograde maxima values. However, there is a critical solute concentration above which a planar solid-liquid interface becomes unstable and breaks into a cellular structure. The solute concentrations and cell sizes associated with this instability are calculated using a perturbation theory, and compared with experimental results.

19002 **(CONF-810446—2(Draft)) TEM studies of defects in laser annealed gallium arsenide.** Fletcher, J.; Narayan, J.; Lowndes, D.H. (Oak Ridge National Lab., TN (USA)). Apr 1981. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01.

From 2. Oxford conference on microscopy of semiconducting materials; Oxford, UK (6 Apr 1981).

The nature and depth distribution of residual damage in ion implanted and pulsed laser annealed GaAs have been studied using both plan-view and cross-section transmission electron microscopy (TEM) specimens for high dose implants (5.0×10^{15} cm^{-2}; Zn^+, Se^+, Mg^+, Si^+). For laser annealing of unencapsulated GaAs, the surface of the GaAs was degraded. The use of thin (~ 300 to 500 A) layers of SiO_2 for encapsulation was found to substantially reduce this surface degradation.

19003 **(CONF-810446—3(Draft)) Studies of defects and solubility limits in SPE grown in- and Sb-implanted silicon.** Fletcher, J.; Narayan, J.; Holland, O.W. (Oak Ridge National Lab., TN (USA)). Apr 1981. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01.

From 2. Oxford conference on microscopy of semiconducting materials; Oxford, UK (6 Apr 1981).

Transmission electron microscopy and Rutherford backscattering, channeling techniques have been used to study residual defects and substitutional concentrations of In and Sb in solid-phase-epitaxial (SPE) recrystallized amorphous layers. The substitutional concentrations of In and Sb ions were found to far exceed the thermodynamic solubility limits in relatively defect-free SPE-grown layers. The RBS results are discussed in view of the observed TEM microstructures.

19004 **(DOE/ER/02754—T1) Structure of glasses containing transition metal ions. Progress report, February 1, 1980-January 31, 1981.** White, W.B.; Fox, K.; Herman, J.S.; Houser, C.; Nelson, C. (Pennsylvania State Univ., University Park (USA). Materials Research Labs.). Jan 1981. Contract AS02-76ER02754. 150p. (COO—2754-6). NTIS, PC A07/MF A01.

This research is concerned with the structure and properties of insulator glasses, particularly as these are modified by transition metal ions in solution. This progress report spans a one-year period and describes the status of the work two-thirds into the sixth contract year. Work on the host glasses has been concentrated on the alkali borosilicate, alkali aluminosilicate and alkali-gallia-silicate glasses. The main interest here is the structure setting for aluminum. The optical absorption spectra of nickel and iron in a variety of glasses have been examined. Utilization of luminescence in addition to optical absorption spectra has permitted the identification of several iron arrangements in glass. The investigation of diffusion processes, particularly hydrogen diffusion, by sputter-induced photon spectrometry (SIPS) has moved from qualitative demonstration to quantitative calculation.

19005 **(GA-A—16197) Modified Weibull theory and stress-concentration factors of polycrystalline graphite.** Ho, F.H. (General Atomic Co., San Diego, CA (USA)). Dec 1980. Contract AT03-76ET35300. 15p. (CONF-810604—2). NTIS, PC A02/MF A01.

From 15. biennial conference on carbon; Philadelphia, PA, USA (22 Jun 1981).

Stress concentration factors (SCF) due to geometric discontinuities in graphite specimens are observed to be much less than the theoretical SCF in an elastic material. In fact, the experimental SCF is always less than two and sometimes even less than one. A four parameter Weibull theory which recognizes the grain size effect is found to give an adequate explanation of the above observed discrepancies.

19006 RF sputtering for controlling dihydride and monohydride bond densities in amorphous silicon hydride. Jeffery, F.R.; Shanks, H.R. (to Dept. of Energy). US Patent Application 181,410. 26 Aug 1980. 16p.

A process is described for controlling the dihydride and monohydride bond densities in hydrogenated amorphous silicone produced by reactive rf sputtering of an amorphous silicon target. There is provided a chamber with an amorphous silicon target and a substrate therein with the substrate and the target positioned such that when rf power is applied to the target the substrate is in contact with the sputtering plasma produced thereby. Hydrogen and argon are fed to the chamber and the pressure is reduced in the chamber to a value sufficient to maintain a sputtering plasma therein, and then rf power is applied to the silicon target to provide a power density in the range of from about 7 watts per square inch to about 22 watts per square inch to sputter an amorphous solicone hydride onto the substrate, the dihydride bond density decreasing with an increase in the rf power density. Substantially pure monohydride films may be produced.

19007 Composition for use in high-temperature hydrogen-fluorine environments and method for making the composition. Kovach, L.; Holcombe, C.E. (to Dept. of Energy). US Patent Application 180,251. 22 Aug 1980. 9p.

The present invention relates to a composition particularly suitable for use as structural components subject to high-temperature environments containing gaseous hydrogen and fluorine. The composition of the present invention consists essentially of lanthanum hexaboride-molybdenum diboride with dispersed silicon. The composition is formed by hot pressing a powder mixture of lanthanum hexaboride as the major constituent and molybdenum disilicide. This composition exhibits substantial resistance to thermal shock and corrosion in environments containing hydrogen and fluorine gases at material surface temperatures up to about 1850°K. Upon exposure of the hot-pressed composition to high-temperature environments containing fluorine gases, a highly protective layer of lanthanum trifluoride containing dispersed molybdenum is formed on exposed surfaces of the composition.

19008 Method and apparatus for drawing monocrystalline ribbon from a melt background of the invention. Ciszek, T.F.; Schwuttke, G.H. (to Dept. of Energy). US Patent Application 179,919. 20 Aug 1980. 10p.

A method and apparatus are described for drawing a monocrystalline ribbon or web from a melt utilizing a shaping die which includes at least two elements spaced one from the other each having a portion thereof located below the level of the melt and another portion located above the level of the melt a distance sufficient to form a raised meniscus of melt about the corresponding element.

40 CHEMISTRY

4001 Analytical And Separations Chemistry

REFER ALSO TO CITATION(S) 17915, 17916, 18082, 18111, 18123, 18125, 19049, 19327, 19433

19009 (DOE/ER/10406—T2) Selective metal-ion extraction for multiple ion liquid-liquid exchange reactions. Progress report, March 1, 1980-February 28, 1981. Tavlarides, L.L. (Illinois Inst. of Tech., Chicago (USA). Dept. of Chemical Engineering). Mar 1981. Contract AS02-79ER10406. 44p. NTIS, PC A03/MF A01.

This research in hydrometallurgical solvent extraction is to develop a fundamental means to predict selectivity during simultaneous solvent extraction of multiple metal ions when the kinetic rates and thermodynamic equilibria both do not favor the desired metal. To this end the chemical kinetics and thermodynamic chemical equilibria models for the system copper-iron-acid sulfate solutions extracted by β-alkenyl - 8-hydroxy quinoline in xylene are being determined. These models can be employed with appropriate design equations to predict selectivity factors of the desired species for mixer settler or other two phase contactors. A thermodynamic equilibrium model was developed to describe the distribution of copper only between the aqueous and organic phases. The model considers the aqueous phase ionic equilibria and accounts for impurities in the extractant. The enthalpy of the reaction and the entropy change are -1275 cal/g-mol and 3.46 cal/g-mol, °K respectively. The equation for the temperature dependent thermodynamic equilibrium coefficient is also determined. Kinetic data for the copper-sulfate-β-alkenyl - 8-hydroxy quinoline were obtained using the liquid jet recycle reactor, and a kinetic model was developed. It was determined that the flux of copper is not diffusion controlled but either reaction controlled or mass transfer and reaction controlled. The mechanism which supports this model assumes an interfacial reaction in which the adsorbed organic chelation acid is undissociated and the rate limiting step is the formation of positive charged CuR^+. Chemical equilibria and chemical kinetic studies for the iron-acid sulfate β-alkenyl - 8-hydroxy quinoline - xylene system are in progress.

19010 (DOE/ER/10722—T1) Laser photoelectron spectroscopy of ions. Progress report. Ellison, G.B. (Colorado Univ., Boulder (USA). Dept. of Chemistry). 1 Aug 1981. Contract AC02-80ER10722. 8p. NTIS, PC A02/MF A01.

A negative ion photoelectron spectrometer has been designed and fabricated. We have calibrated this device with respect to its energy resolution and linearity. Representative mass spectra and photodetachment spectra are presented.

19011 (K/TL/AT—40) Cover-gas and air buoyancy correction for the gravimetric analysis of uranium in uranium hexafluoride. Hedge, W.D. (Oak Ridge Gaseous Diffusion Plant, TN (USA)). Mar 1981. Contract W-7405-ENG-26. 6p. NTIS, PC A02/MF A01.

The gravimetric analysis of uranium (U) in uranium hexafluoride (UF_6) necessitates subsampling UF_6 by transferring an aliquot of liquid UF_6 through a vacuum manifold to a fluorothene sample vial. The aliquot of UF_6 is frozen into the vial by cooling with liquid air. Once frozen, a cover-gas is admitted to the vacuum manifold and the vial. The vial is then removed in the cover-gas atmosphere and sealed with a nut-plug-gasket assembly. The cover-gas is admitted to prevent exposure of the frozen UF_6 to moisture in the atmosphere, and the weight of the cover-gas must be considered as part of the gross weight, but not as part of the net weight of the UF_6 within the vial. An air buoyancy correction is also applied to correct for the air displacement of the brass weight equivalents used in obtaining the UF_6 net weight.

19012 (LA—8730-MS) Quality assurance for environmental analytical chemistry: 1976-1979. Gladney, E.S.; Owens, J.W.; Gunderson, T.C.; Goode, W.E. (Los Alamos Scientific Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 178p. NTIS, PC A09/MF A01.

The philosophy and methodology of the Environmental Surveillance Group to assess the quality of their analytical chemistry program is reported. The Quality Control Data Base of available environmental quality assurance standards and of certified and consensus elemental concentrations in quality assurance materials is described. All quality assurance measurements made by H-8 for 1976-1979 are tabulated and quality control charts are presented.

19013 (LA—8755-MS) Test and evaluation results of the ^{252}Cf shuffler at the Savannah River Plant. Crane, T.W. (Los Alamos National Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 59p. NTIS, PC A04/MF A01.

The ^{252}Cf Shuffler, a nondestructive assay instrument employing californium neutron source irradiation and delayed-neutron counting, was developed for measuring ^{235}U content of scrap and waste items generated at the Savannah River Plant (SRP) reactor fuel fabrication facility. The scrap and waste items include high-purity uranium-aluminum alloy ingots as well as pieces of castings, saw and lathe chips from machining operations, low-purity items such as oxides of uranium or uranium intermixed with flux materials found in recovery operations, and materials not recoverable at SRP such as floor sweepings or residues from the uranium scrap recovery operation. The uranium contains about 60% ^{235}U with the remaining isotopes being ^{236}U, ^{238}U, and ^{234}U in descending order. The test and evaluation at SRP concluded that the accuracy, safety, reliability, and ease of use made the ^{252}Cf Shuffler a suitable instrument for routine use in an industrial, production-oriented plant.

19014 (LBL—12422) KELVIN rare gas time-of-flight program. Vernon, M. (Lawrence Berkeley Lab., CA (USA)). Mar 1981. Contract W-7405-ENG-48. 75p. NTIS, PC A04/MF A01.

The purpose of this appendix is to explain in detail the procedure for performing time-of-flight (TOF) calibration measurements. The result of the calibration measurements is to assign a correct length (L) to the path the molecules travel in a particular experimental configuration. In conjunction with time information (t) a velocity distribution (L/t) can then be determined. The program KELVIN is listed.

19015 (RFP—2914) Calorimetry end-point predictions. Fox, M.A. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant). 11 Apr 1981. Contract AC04-76DP03533. 25p. NTIS, PC A02/MF A01.

This paper describes a portion of the work presently in progress at Rocky Flats in the field of calorimetry. In particular, calorimetry end-point predictions are outlined. The problems associated with end-point predictions and the progress made in overcoming these obstacles are discussed. The two major problems, noise and an accurate description of the heat function, are dealt with to obtain the most accurate results. Data are taken from an actual calorimeter and are processed by means of three different noise reduction techniques. The processed data are then utilized by one to four algorithms, depending on the accuracy desired to determined the end-point.

19016 (RFP—3187) Extraction behavior of americium and plutonium with mixed-solvent extractions. Navratil, J.D.; Martella, L.L. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant). 1981. Contract AC04-76DP03533. 9p. (CONF-810520—3). NTIS, PC A02/MF A01.

From Symposium on separation science and technology for energy applications; Gatlinburg, TN, USA (5 May 1981).

The mixed solvent extractants, dibutyl N,N-diethylcarbamoylmethylene-phosphanate (DBDECMP)-tributyl phosphate (TBP), using carbon tetrachloride diluent, were studied for extracting americium (III) and plutonium (IV) from 0.35 and 7M HNO_3 at 25°C. Significant synergistic effects were observed in this system as was the case with preliminary results (described herein) using the dihexyl analogue DHDECMP and TBP.

19017 (SAND—81-0132) Measurement of hydrogen in an alumina ceramic by total reflection infrared spectroscopy. Tallant, D.R. (Sandia National Labs., Albuquerque, NM (USA)). Apr 1981. Contract AC04-76DP00789. 15p. NTIS, PC A02/MF A01.

Alumina-based ceramics used as high voltage insulators in neutron generator tubes have been found to outgas hydrogen under thermal treatment. In this study these ceramics were examined by infrared spectroscopy using a total reflection technique to identify and measure the concentration of hydrogen-containing species. Results suggest that the surface of the ceramic does not contain significant adsorbed hydrogen. The observed hydroxyl absorption intensity corresponds to a bulk concentration of about 10^{18} hydrogen ions per cubic centimeter.

19018 (UCID—19025) Gold and silver in stream sediments from reconnaissance of 3 x 10^5 KM^2 of the western United States. Van Konynenburg, R.A.; McMillan, G.G.; Higgins, G.H. (Lawrence Livermore National Lab., CA (USA)). 28 Apr 1981. Contract W-7405-ENG-48. 24p. NTIS, PC A02/MF A01.

As part of the National Uranium Resource Evaluation (NURE) Program, Lawrence Livermore National Laboratory analyzed about 30,000 stream sediment samples from selected areas of the western United States for numerous chemical elements. The analysis was performed by neutron activation. Data for the concentrations of gold and silver for the samples in which they were detected are presented. Gold was detected in 310 samples, and silver in 19. Latitudes and longitudes are given for the sites from which these samples were taken.

19019 Controlled-potential coulometric determination of plutonium with a hydrochloric acid-sulfamic acid electrolyte and phosphate complexing. Jackson, D.D.; Hollen, R.M.; Roensch, F.R.; Rein, J.E. (Univ. of California, Los Alamos). *Analytica Chimica Acta ;* **117**: 205-215(1980).

Total plutonium is selectively determined by a controlled-potential coulometric method in which plutonium is reduced to Pu(III) at 0.25 V (vs. SCE) in a 5.5 M hydrochloric acid-0.015 M sulfamic acid electrolyte, diverse ions are oxidized at 0.57 V, phosphate is added to reduce the Pu(III)-Pu(IV) potential, and Pu(III) is oxidized to Pu(IV) at 0.68 V. None of more than 50 metal ions present in nuclear fuel-cycle material interferes. Many anions are without effect and most interfering ones are removed by preliminary fuming with perchloric acid. The apparatus described consists mainly of commercial components. The relative standard deviation is $< 0.1\%$ at the 5-mg plutonium level.

19020 Nondestructive measurement of alpha emitters in solid wastes embedded in various matrices. Escarieux, E.; Gaudiau, J.; de Kerviller, H.; Rolard, J.C. (Centres d'Etudes Nucleaires de Fontenay-aux-Roses, France). pp 517-529 of International meeting on monitoring of Pu-contaminated waste. Luxembourg; Commission of the European Communities (1979). (In French)

From International meeting on monitoring of Pu-contaminated waste; Ispra, Italy (25 Sep 1979).

4002 Inorganic And Physical Chemistry

REFER ALSO TO CITATION(S) 17959, 18143, 18144, 19030, 19031, 19044

19021 (CONF-800561—3) Computer simulation of the diffusion behavior of an ordered adsorbate. Murch, G.E. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 12p. NTIS, PC A02/MF A01.

From International conference on ordering in two dimensions; Lake Geneva, WI, USA (28 May 1980).

This paper reports on new Monte Carlo results for the chemical diffusivity of an ordered adsorbate. The model used is the square planar lattice gas with repulsive nearest neighbor interactions and attractive next nearest neighbor interactions. The simulation is based on the recently formulated rigorous Darken equation. Within the ordered c (2 x 2) region a strong maximum in the diffusivity as a function of coverage is observed. It is demonstrated that this maximum is a direct consequence of the large gradient in the adsorption isotherm within the ordered region.

19022 (DOE/ER/04254—4) Properties of supported metal catalysts. Progress report, 1 Apr 1980-1 March 1981. Butt, J.B.; Burwell, R.L. Jr.; Cohen, J.B. (Northwestern Univ., Evanston, IL (USA)). Mar 1981. Contract AS02-77ER04254. 26p. NTIS, PC A03/MF A01.

The set of Pd/SiO_2 catalysts described in Report COO-4254-3 has been further characterized by in-situ, controlled atmosphere x-ray diffraction studies. In-situ reaction studies have also been conducted for methylcyclopropane hydrogenolysis and the formation of palladium hydride has been detected for the first time during a catalytic reaction. Isotopic exchange between cyclopentane and deuterium has been investigated for the series. This reaction is structure sensitive with the turnover number increasing monotonically with percentage metal exposed. Selectivity for exchange is also structure sensitive, with the ratio of d_{10}/d_5 steadily declining with increasing percentage exposed. Similar behavior has been found for the hydrogenation of propylene, although the patterns of structure sensitivity differ. The mean square amplitude of vibration of the Pt atoms (measured with x-rays) has been obtained in situ in different gas environments; it has been found to increase with increasing temperature of H_2 reduction during pretreatment. For low percent Pt exposed in these catalysts, it was found that Pt changes form with increasing temperature of hydrogen reduction during pretreatment. The volume fraction determined from the area of the diffraction peak decreases appreciably. An examination of the Pt fluourescent x-rays however, shows that the Pt is still present.

19023 (DOE/ER/04341—5) Progress report, December 1, 1979-November 30, 1980. Bernasek, S.L. (Princeton Univ., NJ (USA). Dept. of Chemistry). 1980. Contract AS02-77ER04341. 7p. (COO—4341-5). NTIS, PC A02/MF A01.

The mechanism of chemical poisoning of model heterogeneously catalyzed reactions on transition metal surfaces is studied. Clean Mo(001) surfaces were characterized; results suggest a first-layer contraction of 10% of the bulk interlayer spacing. Characterization of clean Co(0001) surfaces is underway. Decomposition of formic acid on Mo(001) surfaces is being studied. (DLC)

19024 (DOE/ER/06042—3) Correlations of physical and chemical properties of lanthanide oxides with catalytic behaviors. Progress report, September 1, 1980-August 31, 1981. Rosynek, M.P. (Texas A and M Univ., College Station (USA). Dept. of Chemistry). 1981. Contract AS05-78ER06042. 27p. NTIS, PC A03/MF A01.

Using the batch reaction/analysis system that has been described in a previous Progress Report, separate characterization of the behaviors of both La_2O_3 and Nd_2O_3 for ethanol decomposition have been completed. Investigation of the corresponding properties of Pr_2O_3 for this reaction is in progress. In spite of their dissimilar cationic electronic/magnetic properties and differing surface basicities, the catalytic behaviors of La_2O_3 and Nd_2O_3 are virtually identical in all respects for both dehydration and dehydrogenation pathways of the alcohol conversion. This similarity involves not only their initial activity/selectivity parameters, but also their responses to variations in catalyst preparation/pretreatment conditions, crystallographic phase, and poisoning of the differnt kinds of catalytic sites. Preliminary results for Pr_2O_3 indicate that its behavior also closely resembles those of La_2O_3 and Nd_2O_3. Detailed discussions of the dehydration and dehydrogenation pathways are presented in this report.

19025 Aqueous fluoroxysulfate: decomposition and some chemical reactions. Thompson, R.C. (Univ. of Missouri, Columbia); Appelman, E.H. *Inorganic Chemistry ;* **19**: No. 11, 3248-3253(Nov 1980).

Aqueous SO_4F^- decomposes to form O_2, H_2O_2, and HSO_5^-. At 15°C in 0.01 M $HClO_4$ the first-order rate constant k = 3.6 x $10^{-4}s^{-1}$, ΔH^{++} = 16.8 +- 0.4 kcal/mol, and ΔS^{++} = -15.7 +- 1.5 cal/(mol deg). The H_2O_2 and O_2 products both contain one oxygen atom from solvent and one from the fluoroxysulfate. The HSO_5^- product also contains an atom of solvent oxygen in its terminal peroxide position. A mechanism is proposed in which the rate-determining steps are the interaction of SO_4F^- with water fo form HSO_5^- and H_2O_2. The H_2O_2 probably interacts further with SO_4F^- by means of a free-radical chain reaction to produce O_2. Fluorosulfate ion, SO_3F^-, appears to be formed only in the oxygen-transfer step that produces H_2O_2. Chlorite ion is rapidly oxidized to ClO_2 by SO_4F^- in accordance with the rate law -d[SO_4F^-]/dt = k/sub ClO_2^-/[ClO_2^-][SO_4F^-]. In acid solution at 14.7°C, k/sub ClO_2^-/ = 1.8 x 10^4 L/(mol s), ΔH^{++} = 7.3 +- 0.6 kcal/mol, and ΔS^{++} = -14 +- 2 cal/(mol deg). The oxidation of $Co(NH_3)_5ClO_2^{2+}$ by SO_4F^- produces ClO_2 and a mixture of $Co(NH_3)_5F^{2+}$ and $Co(NH_3)_5H_2O^{3+}$. The oxidation of Cr^{2+} by SO_4F^- produces 42 to 47% Cr^{3+} and 41 to 45% CrF^{2+}, the balance consisting of polynuclear Cr(III) species. The oxidation of I^- to I_2 by SO_4F^- consumes no acid and hence does not produce SO_3F^-. These rapid reactions may be interpreted in terms of mechanisms involving either 1- or 2-equiv oxidation in the rate-determining steps. Oxygen transfer does not appear to be significant, but fluorine transfer is obviously involved at least in the oxidation of Cr^{2+} and $Co(NH_3)_5ClO_2^{2+}$.

19026 Variational transition-state theory. Truhlar, D.G. (Univ. of Minnesota, Minneapolis); Garrett, B.C. *Accounts of Chemical Research ;* **13**: No. 12, 440-448(Dec 1980).

A general introduction to and some results from studies of a procedure called variational transition-state theory are presented. A fundamental assumption of this theory is that the net rate of forward reaction at equilibrium equals the equilibrium flux in the product direction through the transition state where the transition state is a surface in phase space dividing reactants from products. Classical generalized-transition-state-theory calculations for nine collinear systems are compared to classical trajectory calculations. This new technique should provide useful insight into the successes and failures of the conventional theory and useful quantitative estimates of possible errors on the predictions of conventional transition-state theory. This should also contribute to a more accurate theory now available for the practical calculations of chemical reaction rates and thermochemical and structural interpretations of rate processes. (BLM)

19027 Thermodynamic behavior of electrolytes in mixed solvents. II. Furter, W.F. (ed.). Washington, DC; American Chemical Society (1979). 409p. (CONF-780305—P7).

From American Chemical Society conference; Anaheim, CA, USA (12 Mar 1978).

Twenty-two chapters discuss topics ranging from the energy-saving potential of solvent extraction to the effects of electrolytes on the properties of mixed-solvent systems. Separate abstracts were prepared for two chapters treating electrolytes in sulfolane(tetramethylenesulfone). (DLC)

19028 New preparative methods and characterization of double phosphates containing cerium(III) and alkali metals: $M_3Ce(PO_4)_2$. Bamberger, C.E.; Robinson, P.R.; Sherman, R.L. (Oak Ridge National Lab., TN). Contract W-7506-ENG-26. *Inorganica Chimica Acta ;* **34**: L203-L205(1979).

The reactions of CeO_2 with various alkali metal hydrogen orthophosphates, -metaphosphates, and -pyrophosphates at temperatures up to 1000°C were studied. It was found that CeO_2 was reduced to Ce(III), yielding nearly stoichiometric amounts of gaseous oxygen. Analysis of the solid products of these reactions by powder x-ray diffraction indicated the formation of $Na_3Ce(PO_4)_2$, and of $K_3Ce(PO_4)_2$. A new method for the preparation of $Na_3Ce(PO_4)_2$ and $K_3Ce(PO_4)_2$ and their characterization is described, along with some of their physical and chemical properties. The preparations can be represented by the following equations: $2CeO_2 + 3M_4P_2O_7$ (or $6M_2HPO_4$) → $2M_3Ce(PO_4)_2 + 2M_3PO_4 + 1/2O_2$ (+$3H_2O$) (1) $2CeO_2 + (MPO_3)_3$, (or $3NaH_2PO_4$) → $M_3Ce(PO_4)_2 + CePO_4 + 1/2\ O_2$ (+$3H_2O$) (2) $CePO_4 + M_3PO_4$ → $M_3Ce(PO_4)_2$ (3) $xM_{33}Ce(PO_4)_2 + xM_3PO_4 + x/4\ O_2$ → $xCeO_2 + 3/2\ xM_4P_2O_7$ (4) (where x << 1). (DP) 1 table.

4003 Organic Chemistry

REFER ALSO TO CITATION(S) 17995, 18021, 18023, 18027, 18143, 18144, 18257, 18298, 18299, 19022, 19022, 19026, 19035, 19035, 19035, 19041, 19044, 19050, 19185, 19186, 19187, 19251

19029 (DOE/ER/10755—T1) Unimolecular decay dynamics of internal energy selected molecules. Technical progress report. (Wisconsin Univ., Madison (USA)). 1980. Contract AC02-80ER10755. 8p. NTIS, PC A02/MF A01.

Direct excitation of overtone vibrations in combination with time-resolved spectroscopic detection probes unimolecular processes in new detail. Observing product luminescence produced by the decay of tetramethyldioxetane excited to v = 3, 4, or 5 of the CH stretching vibration yields the unimolecular decay rate directly, provides overtone vibration spectra on a low pressure gas phase molecule, and reveals a new feature to the chemiluminescence kinetics. Laser induced fluorescence experiments to extend this work to include product state detection are in preparation.

19030 Isocyanide insertion reactions. The reaction of $Mn(CO)_4CNCH_3$ anion with iodomethane and the crystal and molecular structure of $(CH_3)N == C(CH_3)(CH_3)C == N(CH_3)Mn(CO)_3Mn(CO)_3$. Adams, R.D. (Yale Univ., New Haven, CT). Contract AC02-78ER04900. *Journal of The American Chemical Society ;* **102**: No. 25, 7476-7479(3 Dec 1980).

The cyclic compounds $(CH_3)N == C(CH_3)(CH_3)C == N(CH_3)Mn(CO)_3(I)$ was obtained from the reaction of $Mn(CO)_4(CNCH_3)^-$ with CH_3I. The product was analyzed crystallographically. Crystal data: space group P1-bar, a = 7.352 (2) A, b = 8.863 (2) A, c = 12.324 (6) A, α = 83.44 (4)°, β = 85.66 (3)°, γ = 72.45 (2)°, Z = 2, V = 760.0 (6) A^3, rho/sub calcd/ = 1.70 g/cm^3. The molecule contains a five-membered metallacyclic ring consisting of one manganese atom and a tetramethyl-α-diimine ligand. The latter is bonded to the manganese atom via the nitrogen atoms. The five-membered ring is bonded via

the two imine π bonds and the manganese atom to a manganese tricarbonyl group. The Mn-Mn bonding distance is 2.615 (1) A. The molecule is formally isoelectronic and isostructural to the cyclic RC == C(R)(R)C == C(R)Fe(CO)$_3$Fe(CO)$_3$ molecules which have been widely discussed in the development of the theories of semibridging carbonyl ligands. The relaionship of I to these molecules is discussed.

19031 **Kinetics and mechanism of the reaction of palladium(II) complexes of o-(diphenylphosphino)thioanisole and o-(diphenylphosphino)selenoanisole with nucleophiles thiocyanate and iodide. Carbon-13 NMR spectroscopy of the methyl-heteroatom complexes and x-ray structural characterization of diiodobis[o-(diphenylphosphino)benzenethiolato]dipalladium(II).** Roundhill, D.M.; Roundhill, S.G.N.; Beaulieu, W.B.; Bagchi, U. (Washington State Univ., Pullman). *Inorganic Chemistry ;* **19**: No. 11, 3365-3373(Nov 1980).

The kinetics of the reaction of the nucleophiles thiocyanate and iodide with complexes $PdX_2(o\text{-}MeSC_6H_4PPh_2)$ (X = SCN, I) show a rate law rate = $k_2[PdX_2(o\text{-}MeSC_6H_4PPh_2)][X^-]$. Second-order rate constants k_2 for the thiocyanate reaction have been measured, and the activation parameters ΔH^{++} and ΔS^{++} are 22.9 +- 1.0 kcal/mol and -9.2 +- 2.1 cal/mol. For the selenium analogue complex these respective values are 18.9 +- 1.3 kcal/mol and -12.9 +- 2.3 cal/mol. With iodide as nucleophile an equilibrium condition is established. Rates are calculated from the data both for the demethylation and for the reverse addition of methyl iodide. The alkylation reaction is approximately 50 times faster. The product from the iodide demethylation reaction is considered to be the anion $[PdI_2(o\text{-}SC_6H_4PPh_2)]^-$ on the basis of visible spectroscopy. The mechanism of the nucleophile-induced demethylation reaction resembles the Zeisel ether cleavage.

4004 Electrochemistry

REFER ALSO TO CITATION(S) 18257, 19027

19032 **(SU-DMS—80-R-1) Diffusion of oxygen in liquid-metal systems. Progress report, June 1, 1980-May 31, 1981.** (Stanford Univ., CA (USA)). Mar 1980. Contract AT03-76ER70037. 83p. NTIS, PC A05/MF A01.

The ac electrical conductivity of yttria-stabilized zirconia solid electrolyte specimens, ZrO_2 + 8 wt % Y_2O_3, with porous Pt-paste electrodes has been studied over a temperature range of 400 to 1000°C in air. The complex admittance of these specimens was determined over a frequency range from 2HZ to 400 KHZ. The true lattice (bulk) conductivity is separated from grain boundary effects and from electrode polarization through the analysis of the complex admittance plots. Several observations were made on the degradation and contamination of solid oxide electrolytes.

4005 Photochemistry

REFER ALSO TO CITATION(S) 18489, 19438

19033 **(BNL—28756) Near-resonant vibration → vibration energy transfer under single-collision conditions.** Breener, D.M. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC04-76CH00016. 12p. (CONF-810609—3). NTIS, PC A02/MF A01.

From 8. international symposium on molecular beams; Cannes, France (1 Jun 1981).

Energy transfer in single collisions of propynal (HC triple bond C-CHO) subsequent to ir multiphonon absorption (CO_2 laser) was studied. SiF_4, CH_3F, CCl_4, and CH_4 were added. (DLC)

19034 **(DOE/ER/06030—T2) Kinetic study of radical-aromatic hydrocarbon reactions. Annual progress report No. 3, 1 May 1980-31 March 1981.** (Georgia Inst. of Tech., Atlanta (USA). Research Inst.). 3 Apr 1981. Contract AS05-78ER06030. 24p. NTIS, PC A02/MF A01.

During the last 12 months, the analysis of some of the data on OH reactions with benzene and toluenes were completed. The following OH reactions were also studied: OH + o-xylene → products at 298-870 K; OH + m-xylene → products at 250-970 K; and OH + p-xylene → products at 298-970 K. This work is now complete and has been written up for publication in the Journal of Physical Chemistry. Apart from the above-mentioned OH reactions, the following O(^{3}P) reactions have been studied utilizing the flash photolysis-resonance fluorescence technique: O(^{3}P) + C_6H_6 → products at 298-870 K (1); O(^{3}P) + C_6D_6 → products at 298-806 K (2); O(^{3}P) + $C_6H_5CH_3$ → products at 298-930 K (3); O(^{3}P) + $C_6H_5CD_3$ → products at 298-930 K (4); O(^{3}P) + o-xylene → products at 298-970 K (5); O(^{3}P) + m-xylene → products at 298-970 K (6); and O(^{3}P) + p-xylene → products at 298-970 K (7).

19035 **(LBL—10594) Effect of nuclear spin on chemical reactions and internal molecular rotation.** Sterna, L.L. (Lawrence Berkeley Lab., CA (USA)). Dec 1980. Contract W-7405-ENG-48. 356p. NTIS, PC A16/MF A01.

Thesis.

Part I of this dissertation is a study of the magnetic isotope effect, and results are presented for the separation of ^{13}C and ^{12}C isotopes. Two models are included in the theoretical treatment of the effect. In the first model the spin states evolve quantum mechanically, and geminate recombination is calculated by numerically integrating the collision probability times the probability the radical pair is in a singlet state. In the second model the intersystem crossing is treated via first-order rate constants which are average values of the hyperfine couplings. Using these rate constants and hydrodynamic diffusion equations, an analytical solution, which accounts for all collisions, is obtained for the geminate recombination. The two reactions studied are photolysis of benzophenone and toluene and the photolytic decomposition of dibenzylketone (1,3-diphenyl-2-propanone). No magnetic isotope effect was observed in the benzophenone reaction. ^{13}C enrichment was observed for the dibenzylketone reaction, and this enrichment was substantially enhanced at intermediate viscosities and low temperatures. Part II of this dissertation is a presentation of theory and results for the use of Zeeman spin-lattice relaxation as a probe of methyl group rotation in the solid state. Experimental results are presented for the time and angular dependences of rotational polarization, the methyl group magnetic moment, and methyl-methyl steric interactions. The compounds studied are 2,6-dimethylphenol, methyl iodide, 1,4,5,8-tetramethylanthracene, 1,4,5,8-tetramethylnaphthalene, 1,2,4,5-tetramethylbenzene, and 2,3-dimethylmaleicanhydride.

19036 **(NBS-SPEC.PUBL.—578) Catalog of data compilations on photochemical and photophysical processes in solution.** Brummer, J.G.; Helman, W.P.; Ross, A.B. (Notre Dame Univ., IN (USA). Radiation Lab.). Nov 1980. Contract AC02-76ER00038. 29p. NTIS, PC A03/MF A01.

In 1971 a Report of the CODATA Task Group for Chemical Kinetics listed 228 reviews, compilations and evaluations of kinetic data which had been published, or which were planned, in preparation or in press. That catalog included only a few publications on photochemistry in solution. Since then the Chemical Kinetics Information Center and other groups sponsored by the National Standard Reference Data System have carried out a number of compilations and evaluations of gas phase kinetic data relevant to photochemistry. The present survey of availability of data compilations on photochemical and photophysical processes in solution has been undertaken in order to find areas where tabulations and reviews of such data have been made; the catalog will provide a reference aid for locating collections of such data. References to compilations and reviews of data on photochemical and photophysical processes in solution have been annotated to indicate subject and data content. Indexes are included for data types, keywords and authors.

19037 **Mechanistic aspects of the photochemistry of metal-metal bonds. Evidence for the intervention of two different primary photoproducts in the photochemistry of (eta^5-$C_5H_5)_2Fe_2(CO)_4$.** Caspar, J.V.; Meyer, T.J. (Univ. of North Carolina, Chapel Hill). *Journal of The American Chemical Society ;* **102**: No. 26, 7794-7795(17 Dec 1980).

The photochemistry of the iron dimer (eta^5-$C_5H_5)_2Fe_2(CO)_4$ was investigated by flash photolysis under both net photochemical and nonphotochemical conditions in inert solvents, cyclohexane and

benzene. Under nonphotochemical conditions, the compounds were found to be completely photochromic and stable for a period of at least several weeks. Either uv of visible flash-photolysis of the dimer was found to lead to two intermediates, which were both present immediately following the flash. However, each specie was found to occur at a different rate and could be studied separately. The shorter lived intermediate was found to return to the original dimer by equal concentration, second-order kinetics within 2 ms after the flash. The longer lived species also returned to the original dimer but by first-order kinetics. Results of studies of the reactivity with added substrates are also reported. (BLM)

19038 **Photochemisty of low-spin iron(III) complexes with macrocyclic ligands.** Ferraudi, G.; Carrasco, C. (Univ. of Notre Dame, IN). *Inorganic Chemistry ;* **19**: No. 11, 3466-3469(Nov 1980).

The charge-transfer photochemistries of $Fe(TIM)(OCH_3)CH_3OH^{2+}$ and $Fe(DMG)_2(OCH_3)CH_3OH$ can be described as a photooxidation of coordinated methanol and the reduction of the metal center. Reduction of $Fe(TIM)(OCH_3)CH_3OH^{2+}$ by hydroxymethyl radicals ($k = 1.9 \times 10^6\ M^{-1}s^{-1}$) and the reoxidation of the Fe(II)-TIM product by dioxygen were investigated by flash photolysis. Quantum yields of the photolysis products were determined as a function of the excitation wavelength. Limiting yields phi/sub L/ = 4.0×10^{-2} for $Fe(TIM)(OCH_3)CH_3OH^{2+}$ and phi/sub L/ = 7.0×10^{-2} for $Fe(DMG)_2(OCH_3)CH_3OH$ were obtained for photonic energies larger than or equal to 76.3 kcal/mol. The photochemical properties of these complexes are attributed to the population of charge-transfer methoxy to iron(III) states.

19039 **Photochemistry of some three-membered heterocycles.** Trozzolo, A.M. (Univ. of Notre Dame, IN); Leslie, T.M.; Sarpotdar, A.S.; Small, R.D.; Ferraudi, G.J.; DoMinh, T.; Hartless, R.L. *Pure and Applied Chemistry ;* **51**: 261-270(1979).

The solid-state photolysis of oxiranes and aziridines produces highly colored ylide intermediates. The stability of these intermediates is dependent on a combination of electronic and steric factors as well as the solid-state constraints of the environment. Flash photolysis studies indicate that two different ylides can be produced in solution at room temperature. These intermediates appear to be identical to those formed consecutively in the solid state of low-temperature glasses. By the use of certain gas-solid reactions, it is possible to control the lifetime of the intermediate so that it is destroyed immediately or continues to exist almost indefinitely. 33 references, 2 tables.

4006 Radiation Chemistry

REFER ALSO TO CITATION(S) 19028

19040 **(MLM—2806(OP)) Electron and photon interactions with $KClO_4$.** Moddeman, W.E.; Wang, P.S.; Vogt, B.J.; Testoni, A.L.; Wittberg, T.N. (Mound Facility, Miamisburg, OH (USA); Dayton Univ., OH (USA)). 1981. Contract AC04-76DP00053. 10p. (CONF-810332—1). NTIS, PC A02/MF A01.

From 10. DOE conference of surface studies and 5. SUBWOB-12B technical exchange; Livermore, CA, USA (10 Mar 1981).

The interaction of $KClO_4$ with electron beam and x-ray photons was examined. From the Auger data, it was found the electrons rapidly decompose $KClO_4$. High resolution XPS showed $KClO_4$ to be unstable to non-monochromatic Mg and Ti photon sources and stable to monochromatized AlK/sub α/ x-ray radiation. These data are discussed in terms of degradation mechanisms involving: (1) sample heating and (2) electronic excitations or charge accumulation.

19041 **Very low temperature pulse radiolysis. Protiated and perdeuterated methanol glasses at 6 K.** Perkey, L.M. (Univ. of Notre Dame, IN); Smalley, J.F. Contract EY-76-C-02-0016. *Journal of Physical Chemistry, The ;* **83**: No. 23, 2959-2964(1979).

Spectra resulting from the pulse radiolysis of glasses CH_3OH and CD_3OH at 6 K were observed. The absorption maxima of these spectra (625 nm for CH_3OH and 720 nm for CD_3OD-observed 100 ns after the beginning of the electron pulse) are only slightly red shifted from the absorption maximum obtained when either of these alcohols is γ irradiated at 4.2 K (i.e., 600 nm). Bleaching studies indicate that these γ radiolysis spectra are composed of a visible part which is due to solvated electrons and an infrared part which is due to trapped electrons. The infrared portions of the pulse radiolysis spectra at 6 K are enhanced compared to the above γ radiolysis spectra, and they decay to the latter spectra by a process which is approximately first order. Benzyl chloride also reduces the infrared absorptions which are produced by an electron pulse at 6 K more effectively than it reduces the visible absorptions. The species which is responsible for the transient infrared absorption at 6 K is tentatively identified as an electron localized in either a very shallow trap or a trap which is geminate to its parent cation. In either case, since these pulse radiolysis spectra are fully developed immediately after the electron pulse, it is concluded that electrons are localized in preexisting potential wells which may be either deep or shallow in vitreous methanol. 50 references, 5 figures, 3 tables.

4007 Radiochemistry And Nuclear Chemistry

REFER ALSO TO CITATION(S) 19249

19042 **(LBL—11599) Symposium commemorating the 25th anniversary of the discovery of mendelevium.** Seaborg, G.T. (ed.). (Lawrence Berkeley Lab., CA (USA)). 1980. Contract W-7405-ENG-48. 70p. (CONF-800362—). NTIS, PC A04/MF A01.

From 25. anniversary of the discovery of mendelevium meeting; Berkeley, CA, USA (28 Mar 1980).

The Symposium honoring the 25th Anniversary of the discovery of mendelevium was held at the Lawrence Berkeley Laboratory on March 28, 1980. The following three papers were presented: Chemical Properties of Mendelevium; Nuclear Properties of Mendelevium; and Radioactive Decay of Md Isotopes. Besides these papers there were introductory remarks, reminiscences, and concluding remarks.

19043 (LBL—11599, pp 32-43) **Chemical properties of mendelevium.** Hulet, E.K. (Lawrence Livermore Lab., CA). 1980. NTIS, PC A04/MF A01.

From 25. anniversary of the discovery of mendelevium meeting; Berkeley, CA, USA (28 Mar 1980).

The isotope ^{256}Md is nearly always employed for chemical studies of this element. This nuclide can be made by bombardment of fractions of a microgram of ^{254}Es with intense alpha-particle beams which will produce about 10^6 atoms of ^{256}Md with a half-life of 77 minutes. Even with the most intense ion beams and the largest available quantities of target isotope, about 10^6 atoms at a time is all the Md that can be produced for chemical studies. This lack of sufficient sample size coupled with the very short lifetimes of the few atoms produced has severly restricted the gathering and broadening of our knowledge concerning the properties of Md and the heavier elements. To illustrate, the literature contains a mere eleven references to the chemical studies of Md, and none of these deal with bulk properties associated with element found in solid phases. Some of these findings are: Md was found to be more volatile than other actinide metals which lead to the belief that it is divalent in the metallic state; separation of Md from the other actinides can be accomplished either by reduction of Md to the divalent state or by chromatographic separations with Md remaining in the tripositive state; extraction of Md with bis(2-ethylhexyl)phosphoric acid is much poorer than the extraction of the neighboring tripositive actinides; attempts to oxidize Md wih sodium bismuthate failed to show any evidence of Md^{4+}; standard reduction potential of Md^{3+} was found to be close to -0.1 volt; Md^{3+} can be reduced to Md(Hg) by sodium amalgams and by electrolysis; the electrochemical behavior of Md is very similar to that of Fm and can be summarized in the equation, $Md^{2+} + 2e^- = Md(Hg)$, and $E^0 = 1.5$ V.

19044 (LBL—12401) Structure and bonding in organolanthanide and -actinide compounds. Eigenbrot, C.W. Jr. (Lawrence Berkeley Lab., CA (USA)). Feb 1981. Contract W-7405-ENG-48. 174p. NTIS, PC A08/MF A01.

The reactions of $U(C_5H_5)_3(THF)$ and $U(C_5H_4CH_3)_3(THF)$ with pyrazine led to the formation of dimeric, π-bridged species of U^{3+} of formulae $[U(C_5H_5)_3]_2(C_4H_4N_2)$ and $[U(C_5H_4CH_3)_3]_2(C_4H_4N_2)$. The dimeric formulation of the two compounds is indicated by the X-ray powder pattern of $[U(C_5H_5)_3]_2(C_4H_4N_2)$, the mass spectra of both compounds, and the pmr spectrum of $[U(C_5H_4CH_3)_3]_2(C_4H_4N_2)$. Preliminary results indicate unusual magnetic behavior at low temperature. The compound $U(C_5H_5)_3(C_3H_3N_2)$ has been prepared by the reaction between $U(C_5H_5)_3Cl$ and $Na(C_3H_3N_2)$ in THF. The reactions between $U(C_5Me_5)_2Cl_2$ and $C_3H_4N_2$ and $Na(C_3H_3N_2)$ in THF have led to the isolation of three new compounds of formulae $U(C_5Me_5)_2Cl_2(C_3H_4N_2)$, $U(C_5Me_5)_2Cl(C_3H_3N_2)$, and $U(C_5Me_5)_2(C_3H_3N_2)_2$. These new compounds have been characterized by their infra-red, visible-near IR, pmr, and mass spectra; and by single crystal X-ray diffraction. The crystal and molecular structure of the known complex $[Nd(N(C_2H_5NH_2)_3)_2(CH_3CN)](ClO_4)_3$ has been determined by single crystal X-ray diffraction.

19045 Preparation and Moessbauer spectra of neptunium(III)-alkali metal-chloro compounds. Karraker, D.G.; Stone, J.A. (Savannah River Lab., Aiken, SC). Contract DE-AC09-76SR00001. *Inorganic Chemistry ;* **19**: No. 11, 3545-3547(Nov 1980).

The preparation of Np(III)-chloro compounds of the composition M_2NpCl_5 and $NpCl_3.4CH_3CN$ by the reduction of a 50:1 acetonitrile-propionic acid solution of MCl where M = K, NH_4, or Rb and $NpCl_4$ with zinc amalgam is described. The Moessbauer spectra of preparations analyzed as $MNpCl_4.XCH_3CN$ where X = 1,2 could be reproduced by the spectra of a mixture of M_2NpCl_5 and $NpCl_3.4CH_3CN$ indicating that the preparations could be presumed to be mixtures. (BLM)

19046 Positronium and muonium chemistry. Ache, H.J. (ed.). Washington, DC; American Chemical Society (1979). 383p. (CONF-770510—P4).

From 2. joint CIC/ACS conference; Montreal, Canada (31 May 1977).

This book emphasizes comprehensive state-of-the-art reviews and stresses the application of positronium or muonium atoms to various chemical problems. It covers a wide variety of topics ranging from the interactions of the exotic atoms in simple rare gases to the use of positronium in structure studies of complex biochemical compounds. Twelve chapters deal with positron annihilation techniques in accord with solid-state polymerization, diatomic and polyatomic gases, and ANNPEAK (a program for lineshape analysis of Doppler broadening of positron annihilation photons). The last two chapters offer a detailed review of muonium chemistry, including a discussion of radiation chemistry and reaction kinetics of muonium in liquids. Of the 14 chapters, separate abstracts were prepared for four, while one was previously abstracted. (DLC)

19047 Positronium chemistry: jresent and future directions. Ache, H.J. (Virginia Polytechnic Inst., Blacksburg, VA). *Advances in Chemistry Series ;* No. 175, 1-49(1979). (CONF-770510—P4).

From 2. joint CIC/ACS conference; Montreal, Canada (31 May 1977).

In this review an attempt has been made to critically assess the present status of positronium chemistry and positron annihilation techniques as a chemical probe in general. Specifically, the concept that the interactions between positronium atoms and substrate occur primarily via positronium complex formation and that the rate of this reaction is therefore dependent on the nature of the environment in which they occur, has been developed to a method of determining the position of probe molecules in micelles and to evaluate formation constants for inclusion and acceptor-donor complexes of biological interest. Furthermore the positronium formation process was very sensitive to microphase transitions and was used for the assessment of critical micelle concentrations in aqueous and reverse micellar systems. 109 references, 29 figures, 9 tables.

19048 Muonium chemistry: a review. Fleming, D.G. (Univ. of British Columbia, Vancouver); Garner, D.M.; Vaz, L.C.; Walker, D.C.; Brewer, J.H.; Crowe, K.M. *Advances in Chemistry Series ;* No. 175, 279-334(1979). (CONF-770510—P4).

From 2. joint CIC/ACS conference; Montreal, Canada (31 May 1977).

The muonium atom can properly be regarded as an ultralight isotope of hydrogen, in which the proton nucleus is replaced by a positive muon of only one-ninth its mass. Within the Born-Oppenheimer approximation, the chemical is identical up to differences in reaction dynamics; thus, muonium chemistry studies greatly extend the range of observable mass-sensitive effects in chemical kinetics. The theoretical background of muonium chemistry is presented and applied to thermal kinetic studies in both gas- and liquid-phase systems, drawing on current experimental results (primarily from TRIUMF and SIN) which reveal both normal and inverse dynamic isotope effects. Associated phenomena such as muonium hot atom reactions are also discussed. 89 references, 21 figures, 5 tables.

4008 Combustion, Pyrolysis, And High-temperature Chemistry

19049 (DOE/ER/04939—T1) Measurement of radical-species concentrations and polycyclic aromatic hydrocarbons in flames by fluorescence and absorption using a tunable dye laser. Progress report, March 1, 1980-February 28, 1981. Lucht, R.P.; Sweeney, D.W.; Laurendeau, N.M. (Purdue Univ., Lafayette, IN (USA). School of Mechanical Engineering). Mar 1981. Contract AS02-78ER04939. 43p. (COO—4939-3). NTIS, PC A03/MF A01.

A theoretical and experimental investigation of OH saturated fluorescence is described. The goal of the research is to develop a saturated fluorescence technique which will yield accurate molecular number densities over a wide range of flame pressure, temperature, and composition. Experimentally, OH is excited by a ten nanosecond pulse from a Nd:YAG-pumped dye laser tuned to an isolated rotational transition in the (0,0) band of the $A^2\Sigma^+$-X^2 pi electronic system. The resulting fluorescence signal is resolved both spectrally and temporally. Total OH number densities are calculated by collecting fluorescence from the directly excited upper rotational level, and using the balanced cross-rate model to analyze the experimental data. Fluorescence measurements of OH number density agree to within a factor of three with the results of independent OH absorption measurements. Significantly, the ratio of the fluorescence signal to the number density measured by absorption is nearly the same in 30, 100 and 250 torr $H_2/O_2/N_2$ flat flames, demonstrating the insensitivity of the saturated fluorescence signal to the quenching environment of the radical. Collisional transfer in excited OH is studied by recording the time development of OH fluorescence spectrum. The experimental spectra are compared with the results of time-dependent computer modeling. By varying rotational transfer rates until the calculated and experimental spectra agree, rotational transfer cross sections can be calculated. The signal processing system was thoroughly checked by comparing the photomultiplier output to that of a fast photodiode, and by comparing single pulse Rayleigh scattering and fluorescence traces with sampling oscilloscope traces.

19050 (DOE/ER/14953—1) Studies of combustion kinetics and mechanisms. Gutman, D. (Illinois Inst. of Tech., Chicago (USA). Dept. of Chemistry). 30 Jan 1981. Contract AS02-78ER14953. 14p. NTIS, PC A02/MF A01.

The current research has two objectives; first the development of an entirely new method for studying the elementary reactions of polyatomic free radicals, and second, the use of the new method to obtain quantitative information on their reactions which are important in combustion processes. We have now designed, built and tested the apparatus needed for these studies as well as used the equipment to study reactions of the C_3H_5 and CH_3 radicals ($C_3H_5 + NO_2$; $C_3H_5 + Br_2$; $CH_3 + NO_2$). In addition suitable free-radical precursors were searched for future studies.

19051 **(DOE/TIC—11437) Enhanced combustion of fossil-fuel particles and droplets in oscillating flow. Annual technical report, 1 September 1978-31 August 1979.** Lyman, F.A.; Sabnis, J.S. (Syracuse Univ., NY (USA). Dept. of Mechanical and Aerospace Engineering). 31 Aug 1979. Contract ET78-G-01-3303. 39p. NTIS, PC A03/MF A01.

The objective of this research is to determine the effect of oscillating flow on the rates of combustion of fossil fuel particles or droplets. Under certain conditions, an oscillatory (pulsating) flow may produce significantly increased rates of burning of fuel particles or droplets and thus provide more effective fuel utilization, with reduced excess air and improved combustion efficiency. The combustion intensity (energy released per unit volume) is known to be considerably higher in pulsating than in ordinary combustion chambers, so that for the same thermal power output, the chamber volume and cost can be significantly reduced. This would be an important advantage both for large powerplants and for those intended for special applications where space or weight are limited. Despite the technological advantages of pulsating combustion, the process is not well understood. The dependence of burning rate on the amplitude and frequency of the pulsating flow is not known; in fact, the literature contains limited and somewhat conflicting data on the magnitude of the effect of pulsations on burning rate. The present research was undertaken in order to determine the burning times of particles under conditions of controlled amplitude and frequency, and to develop theory to aid in interpretation of experimental data and to predict the effect of pulsations under other conditions. The apparatus built for the experimental work is described. Also a theory is developed and a solution obtained for limiting cases.

19052 **(PSU-FCL-C—80-87) Gas-phase carbon formation rates and mechanisms under high-temperature hydrocarbon reforming conditions. Annual project status and technical progress report, September 28, 1979-September 30, 1980.** Reuther, J.J.; Palmer, H.B.; Yiin, K.C.; Warchol, J.J. (Pennsylvania State Univ., University Park (USA). Dept. of Materials Science and Engineering). Oct 1980. Contract AC21-79MC12736. 19p. NTIS, PC A02/MF A01.

Gas-phase carbon formation/destruction rates and mechanisms will be determined in high-temperature environments produced by a laminar flat flame burner and a turbulent plug-flow reactor as a function of fuel, stoichiometry additive/diluent, and at simulated hydrocarbon-reformer conditions [~ 1000-1400°K; ~ 1 atm]. Accurate measurements of vapor phase chemical microstructure (stable and free radical species) as a function of global soot formation rates in the well-defined systems will provide the information necessary for the identification of the normal mechanism by which soot is produced and the altered mechanism by which soot is suppressed upon addition of diluent or additive. Construction of the subatmospheric-pressure flat flame burner facility is now complete and its detailed description is provided. Several designs have been studied for the liquid fuel vaporization system. The one chosen operates by vaporizing liquid fuel from the surfaces of the heated sintered-copper frits. Design and progress on the construction of the turbulent plug-flow reactor are completed and construction of the high temperature plug-flow reactor has begun. Calculations are being made on a series of C/H/0 systems at temperatures 1000°K, 1200°K, and 1400°K, pressures 0.1 atm, 1 atm, and 10 atm, including solid carbon in some cases but also including systems constrained to be homogeneous and including selected hydrocarbons (CH, C_2H_2 and C_6H_6) at equilibrium. The first calculations have been run on CH_4-0 at 1000°K and 1 atm and results are shown in a graph and discussed. It is interesting to see that carbon will precipitate beyond phi = 3.30, in contrast to the conventional wisdom which says that it will form beyond the point at which there is just sufficient oxygen to yield CO and H_2 as products. That would be phi = 4.00. The experimental carbon point for the system is not known.

19053 **(SAND—81-8206) Fundamental combustion and diagnostics research at Sandia. Progress report, September-December 1980.** Hartley, D.L.; Gusinow, M.A. (Sandia National Labs., Livermore, CA (USA)). Feb 1981. Contract AC04-76DP00789. 64p. NTIS, PC A04/MF A01.

The combustion research emphasizes basic research into fundamental problems associated with combustion. Special emphasis is placed on the development and application of advanced research methods. The overall program addresses: (1) detailed chemistry of combustion, (2) fundamental processes associated with laminar and turbulent flames, (3) development of research techniques specifically applicable to combustion environments, and (4) operation of the user-oriented Combustion Research Facility. Attached are status reports on the research sponsored by OBES. The first section contains activities in Combustion Research, the second section contains activities in Molecular Physics and Spectroscopy, and the third section contains activities in Diagnostics Research.

19054 **(UCRL—85560) Applied chemical kinetics in practical combustion systems.** Westbrook, C.K.; Dryer, F.L. (Lawrence Livermore National Lab., CA (USA); Princeton Univ., NJ (USA)). 23 Feb 1981. Contract W-7405-ENG-48. 8p. (CONF-810621—1). NTIS, PC A02/MF A01.

From Symposium on fluid mechanics of combustion systems; Boulder, CO, USA (22 Jun 1981).

The use of chemical kinetics in combustion models takes two extreme forms. Detailed reaction mechanisms provide a wealth of information which can be important in the analysis of specific physical and chemical processes. Examples of this type of model application were described, and it was emphasized that the results of such studies can have rather wide applications to a variety of combustion environments. At the other extreme, simplified reaction mechanisms can be very useful in models of actual combustors such as internal combustion engines, gas turbines, and furnaces. Some care must be exercised that the simplified kinetics models used still reproduce available experimental data for relevant conditions, but when this restriction is observed the resulting overall system model provides valuable help in the analysis of practical combustion.

19055 **Diffusion and reaction in a stagnant boundary layer about a carbon particle. 5. Pseudo-steady-state structure and parameter sensitivity.** Sundaresan, S.; Amundson, N.R. (Univ of Houston, Tex). *Industrial and Engineering Chemistry, Fundamentals ;* **19**: No. 4, 344-351(Nov 1980).

Models of different degrees of complexity describing diffusion and reaction in a stagnant boundary layer surrounding a carbon particle are constructed. The models include the heterogeneous combustion reactions with the intraparticle effects lumped at the particle surface in concert with radiation resulting in nonlinear boundary conditions. The genesis of steady-state structures associated with carbon combustion is identified. The sensitivity of the steady-state structures of the complexity of the model for diffusion and reaction in the boundary layer and to the choice of values for some key parameters appearing in the model is investigated. The qualitative features of the steady-state structures are sensitive only to the environment with which the particle is in radiant interaction and the O/sub 2/ content in the gas phase. 13 refs.

19056 **Flame propagation under conditions of stoichiometry.** Sivashinsky, G.I. (Tel Aviv Univ, Ramat-Aviv, Israel). *SIAM (Society for Industrial and Applied Mathematics) Journal on Applied Mathematics (Formerly Journal of the Society for Industrial and Applied Mathematics) ;* **39**: No. 1, 67-82(Aug 1980).

A nonlinear analysis is presented of flame front stability assuming stiochiometric composition of the combustible mixture. The constant-density model of a premixed flame is considered. An asymptotic nonlinear partial differential equation, which describes the evolution of the disturbed flame front, is derived. It is shown that plane flame front is stable if the mean Lewis number of the reactants exceeds some critical value close to unity. If this condition does not hold the plane flame front is unstable, and numerical studies demonstrate that the flame assumes the form of a nonstationary cellular surface in a state of continual chaotic division and recombination of cells. A description is given of the effect of local violation of stoichiometry in the vicinity of the disturbed reaction zone, as a result of which the locally-excess component penetrates into the combustion product region. 17 refs.

42 ENGINEERING

4202 Facilities And Equipment

REFER ALSO TO CITATION(S) 18706, 19133, 19134, 19135, 19137, 19377, 19545

19057 (BDX—613-2603) Software documentation for compression-machine cavity control. Floersch, R.H. (Bendix Corp., Kansas City, MO (USA)). Apr 1981. Contract AC04-76DP00613. 249p. NTIS, PC A11/MF A01.

A new system design using closed loop control on the hydraulic system of compression transfer presses used to make filled elastomer parts will result in improved accuracy and repeatability of speed and pressure control during critical forming stages before part cure. The new design uses a microprocessor to supply set points and timing functions to the control system. Presented are the hardware and software architecture and objectives for the microprocessor portion of the control system.

19058 (DOE/ET/15422—7) Sensitivity of the current-voltage characteristic to diode parameters. Stoenescu, M.I.; Nichols, R.A.; Brooks, A.W.; Smith, T.M. (ENCOTH Corp., Princeton, NJ (USA)). Jan 1981. Contract AC02-79ET15422. 28 p. NTIS, PC A03/MF A01.

The physical description of the electrodes and of the plasma is transferred to one point of the diode volt-ampere characteristic represented by one value of the current density J at given output voltage V. The present description is part of a study aimed to analyze the origin of losses of the diode electric current at higher voltages and the impact on the diode performance of modifications on electrode surface, geometry and physics of the outerelectrode region. The choice of the mathematical representation and technique is dictated by the present treatment being a subensemble of a two-dimensional mathematical model.

19059 (EPRI-EL—1757) Magnetic refrigerator development. Final report. Barclay, J.A.; Steyert, W.A. (Los Alamos Scientific Lab., NM (USA)). Apr 1981. 116p. NTIS, PC A06/MF A01.

The reseach program to develop magnetic refrigeration in the 4 to 10K temperature region is described. The original purpose of the program was to provide more efficient refrigeration for superconducting technological applications in power generation and transmission. However, the work reported forms part of the basis for a whole new refrigeration technology with a myriad of applications extending beyond the original objective. To initiate development of the low-temperature refrigerator technology, a gadolinium-metal, magnetic-wheel prototype was designed, built, and tested at room temperature with the objective of understanding the device in an experimentally convenient temperature region. When operating through a 6-T magnetic-field difference, the wheel was designed to provide 1 kW of continuous refrigeration across a 40K span near room temperature and to operate at 70% of Carnot efficiency. The prototype operated through a 1.2-T field difference and provided 1/2 kW of continuous refrigeration over a 7K span at 26% of Carnot efficiency. One problem that was found with this first device was the difficulty of producing simultaneously a high, homogeneous field across the top of the wheel with almost zero field across the bottom of the wheel. Problems with fluid-flow control of both transient and entrained fluid were also encountered. Nevertheless, the performance results at 1.2-T field difference are those predicted by the theory used to determine the design objectives at 6-T field difference. The results of several experiments show that the principle of operation is understood and offers exciting prospects. Experiments with water as the heat exchange fluid and gadolinium as the magnetic material provided up to 1/2-kJ/cycle of refrigeration. The key problem uncovered is that of compensating large magnetic forces while keeping parasitic heat leaks to a minimum.

19060 (LA—8727-MS) Testing and evaluation of the US Navy supplied-air suit. Bradley, O.D.; DeField, J.D. (Los Alamos National Lab., NM (USA)). Feb 1981. Contract W-7405-ENG-36. 42p. NTIS, PC A03/MF A01.

The data evaluating the suit were obtained by following the schedules prescribed in Specifications for Test Procedures for Air-line-Type Supplied-Air Suits, (LA-5958-MS). Testing was limited to (a) determining the protection factors provided, (b) evaluating interior sound pressure levels, (c) evaluating integrity of air lines and connectors, and (d) evaluating suit removal procedures. Tests did not consider heat stress, flammability, or material stressing. The testing was performed by the WPSS using a 16-cubic meter test chamber and a polydispersed dioctyl phthalate (DOP) aerosol. Aerosol concentrations were measured with a Los Alamos model 69H light-scattering photometer capable of reliably indicating leakages of 5 parts in 100,000. Protection factors (PFs) were calculated by establishing a ratio of the challenge aerosol concentration divided by the average peak penetration. Using this method, the Navy spunbonded olefin supplied-air suit indicated protection factors in excess of 18K for all subjects tested and in all tests performed.

19061 (LA—8728-MS) Improved scheme to develop multidimensional generalized yield and failure surfaces for structural elements. Cheney, M.; Duffey, T.A. (Los Alamos Scientific Lab., NM (USA)). Apr 1981. Contract W-7405-ENG-36. 30p. NTIS, PC A03/MF A01.

Techniques are developed and presented for combining readily available two-dimensional convex generalized yield and failure curves for structural elements to form lower bound, higher dimensional interaction surfaces. These higher dimensional surfaces are useful for predicting yielding or failure of structural elements when subjected to several simultaneously interacting generalized stresses at a given cross section. The work is an improvement on an earlier method that tended to be overly conservative. The earlier work is reviewed followed by the introduction of two improved methods, the first based upon the geometrical version of the Hahn-Banach Theorem, and the second based upon the use of Lagrange multipliers. Each method is illustrated by three- and six-dimensional examples, and the degree of conservatism of each is evauated by comparison to exact multidimensional interaction surfaces.

19062 (LBL—11754) Performance of dipole magnets in helium II. Althaus, R.; Caspi, S.; Gilbert, W.S.; Hassenzahl, W.; Meuser, R.; Rechen, J.; Taylor, C.; Warren, R. (Lawrence Berkeley Lab., CA (USA)). Mar 1981. Contract W-7405-ENG-48. 5p. (CONF-810314—118). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

Data from tests in He II of four 1-meter-long magnets are presented. The maximum quench current is increased up to 30 percent, compared with tests in He I. Data from calorimetric measurements of heat generated during cyclic operation are presented. Quenches were induced by heaters placed near the conductor, and the energy required to induce quenches in He II and in He I are compared.

19063 (SAND—80-2794C) Aerodynamic heating on a blunt-cone reentry vehicle. Gonzales, S.C. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 43p. (CONF-810455—1). NTIS, PC A03/MF A01.

From Mexican American Engineering Society conference; Fullerton, CA, USA (13 Apr 1981).

A reentry vehicle system traveling at high velocity as it enters the atmosphere encounters a severe aerodynamic heating environment. The fluid (air) region between the vehicle surface and detached shock wave experiences very high pressures and is heated to several thousand degrees Kelvin. In order to assure vehicle survivability, theoretical analyses are used in the design of an adequate thermal protection system. If the flow field is laminar, maximum heating on a spherical RV nosetip will occur at the stagnation point and generally decrease along the RV at heatshield. However, if the flow field is turbulent, maximum heating will occur near the sonic line, approximately 35 degrees from the stagnation point. In a complete thermal analysis which includes prediction of vehicle response to the reentry evironment, heat conduction and ablation are also considered. Coldwall heat transfer rates are corrected for hotwall effects and used in a transient indepth conduction analysis to establish temperature and ablation histories. Vehicle responses to the reentry environment are compared for bluntness ratios of 0.025 and 0.250.

19064 (SAND—81-0273) Optical/analytical method for determining the space-time trajectory of a free-flight rocket. Stueber, T.F. (Sandia National Labs., Albuquerque, NM (USA)). Dec 1980. Contract AC04-76DP00789. 25p. NTIS, PC A02/MF A01.

The trajectory of a free-flight rocket can be determined by optical means in cases where radars or lasers cannot track effectively. The optical method described in this report uses fixed-position motion picture cameras along the nominal flight line to provide three-dimensional space and time coordinates. The method was used for a test series whose data is included with detailed sample calculations for each step of the algorithm.

19065 (UCID—17948(Rev.1)) Precision machining commercialization. (Lawrence Livermore National Lab., CA (USA); Oak Ridge Y-12 Plant, TN (USA)). 1981. Contract W-7405-ENG-48. 245p. NTIS, PC A11/MF A01.

To accelerate precision machining development so as to realize more of the potential savings within the next few years of known DOD part procurement, the Air Force Materials Laboratory is sponsoring the Precision Machining Commercialization Project (PMC). The goal of PMC is to minimize precision machining development time and cost risk for interested vendors. PMC will do this by making available the high precision machining technology as developed in two DOE contractor facilities, the Lawrence Livermore Laboratory and the Y-12 Plant, at Oak Ridge, TN. The technology of high precision machining is neither exotic nor new, but rather is based on a number of refinements of fundamental machining principles such as better slideways, more accurate spindles, better control systems, better thermal stability, isolation from vibration, application of the laser interferometer for closed-loop tool position control, and part handling and chucking with a sensitivity to fractions of micrometer tolerance. A critical element is the diamond tool bit, which cuts precisely in accordance with its geometry without the built-up edge characteristic of other tools, thus offering the potential of the mirror finish needed for optical parts. Mirror finishes of optical quality directly off the machine cannot now be obtained from other tool bits. A special section of this document covers the purchase, care, application, measuring and sharpening of diamond tool bits. The high precision machining technology referred to herein is the result of over 20 years development largely in support of demanding nuclear weapons fabrication needs. Its application to optical parts is a technical spin-off benefit. We believe that disseminating advanced precision machining technology throughout industry will reveal other industrial applications that are both functionally and economically attractive.

19066 (UCID—19022) Fundamentals of contamination control technology. Stowers, I.F. (Lawrence Livermore National Lab., CA (USA)). 21 Apr 1981. Contract W-7405-ENG-48. 183p. NTIS, PC A09/MF A01.

This booklet contains the graphic illustrations used by the author for a series of lectures given at the Lawrence Livermore National Laboratory and at several national and regional meetings of the American Vacuum Society and the Institute of Environmental Sciences. It is not a textbook and, therefore, not meant to be technically complete. The text has been added to emphasize technical points and to prevent misinterpretation of certain illustrations.

19067 (UCRL—84958) Projectile and rail launcher design analysis for electromagnetic propulsion to velocities exceeding 10 km/s. Buckingham, A.C. (Lawrence Livermore National Lab., CA (USA)). 24 Feb 1981. Contract W-7405-ENG-48. 12p. (CONF-810439—1). NTIS, PC A02/MF A01.

From 15. AIAA/JSASS/DGLR international electromagnetic propulsion conference; Las Vegas, NV, USA (21 Apr 1981).

Hypersonic projectile launch was achieved using thrust exerted by an expanding electromagnetic field acting on the projectile base. Previous designs were confined to simple parallel-opposing flat rails. The rails carried the induction current used to launch rectangular projectiles. The projectiles weighed up to several grams and were launched at nearly 10 km/s. Here, a revised design for the launcher and projectiles using a more conventional cylindrical bore is described. Projectile spin-stabilization was considered together with the associated added-stress loads to projectile and launcher. In addition, both the design of the projectile configuration and materials capable of withstanding earth orbital, earth- and solar-system-escape launch loads, aerodynamic loads, and ablation and erosion penalties were studied. Projectile masses of ten to several hundred kilograms and launch speeds from 20 to 50 km/s are included in the analysis and discussion.

19068 Advances in SQUID magnetometers. Clarke, J. (Univ of Calif, Berkeley). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Electron Devices ;* **ED-27**: No. 10, 1896-1908(Oct 1980).

This paper discusses recent developments in dc and RF SQUID's and describes a number of devices, and compares their sensitivities with the predictions of the models. 42 refs.

19069 Random array grid collimator. Fenimore, E.E. (to Dept. of Energy). US Patent Application 180,252. 22 Aug 1980. 23p.

A hexagonally shaped quasi-random no-two-holes touching grid collimator. The quasi-random array grid collimator eliminates contamination from small angle off-axis rays by using a no-two-holes-touching pattern which simultaneously provides for a self-supporting array increasng throughput by elimination of a substrate. The presentation invention also provides maximum throughput using hexagonally shaped holes in a hexagonal lattice pattern for diffraction limited applications. Mosaicking is also disclosed for reducing fabrication effort.

19070 Quasi-random array imaging collimator. Fenimore, E.E. (to Dept. of Energy). US Patent Application 179,917. 20 Aug 1980. 23p.

A hexagonally shaped quasi-random no-two-holes-touching imaging collimator. The quasi-random array imaging collimator eliminates contamination from small angle off-axis rays by using a no-two-holes-touching pattern which simultaneously provides for a self-supporting array increasing throughput by elimination of a substrate. The present invention also provides maximum throughput using hexagonally shaped holes in a hexagonal lattice pattern for diffraction limited applications. Mosaicking is also disclosed for reducing fabrication effort.

19071 Magnetic flowmeter for electrically conductive liquid. Skladzien, S.B.; Raue, D.J. (to Dept. of Energy). US Patent Application 179,320. 18 Aug 1980. 11p.

A magnetic flowmeter includes first and second tube sections each having walls of non-magnetic material. The first tube is suitably connected to a process for passing a flow of an electrically conductive fluid to be measured. The second tube is established as a reference containing a still medium and is maintained at the same temperature as the first tube. A rotatable magnet assembly is disposed between the two tubes with at least two magnets attached to radially extending arms from a central shaft. Each magnet includes an air gap suitably sized to pass astraddle the diameter along a portion of the length of each of the two tubes. Two magnets are provided in matched pairs spaced 180^{0} apart such that signals will be simultaneously generated in signal leads attached to each of the two tubes. By comparing the signals from the two tubes and varying the rotating speed of the magnet assembly until the signals are equal, or attain a maximum, the flow velocity of the fluid within the first tube can be determined. Through temperature monitoring and appropriate heaters, the two tubes are maintained at the same temperature.

19072 Wrapping process for fabrication of A-15 superconducting composite wires. Suenaga, M.; Klamut, C.J.; Luhman, T.S. (to Dept. of Energy). US Patent Application 178,655. 15 Aug 1980. 9p.

A method for fabricating superconducting wires wherein a billet of copper containing filaments of niobium or vanadium is rolled to form a strip which is wrapped about a tin-alloy core to form a composite. The alloy is a tin-copper alloy for niobium filaments and a gallium-copper alloy for vanadium filaments. The composite is then drawn down to a desired wire size and heat treated. During the heat treatment process, the tin in the bronze reacts with the niobium to form the superconductor niobium tin. In the case where vanadium is used, the gallium in the gallium bronze reacts

with the vanadium to form the superconductor vanadium gallium. This new process eliminates the costly annealing steps, external tin plating and drilling of bronze ingots required in a number of prior art processes.

19073 **Dye filled security seal.** Wilson, D.C.W. (to Dept. of Energy). US Patent Application 170,253. 18 Jul 1980. 9p.

A security seal for providing an indication of unauthorized access to a sealed object includes an elongate member to be entwined in the object such that access is denied unless the member is removed. The elongate member has a hollow, pressurizable chamber extending throughout its length that is filled with a permanent dye under greater than atmospheric pressure. Attempts to cut the member and weld it together are revealed when dye flows through a rupture in the chamber wall and stains the outside surface of the member.

19074 **Novel method and apparatus for controlling aerodynamic performance of an operating axial-flow fluid machine.** Langebrake, C.O. (to Dept. of Energy). US Patent Application 167,561. 11 Jul 1980. 21p.

This invention is an improved method and arrangement for controlling the aerodynamic performance of an axial-flow fluid machine during its operation. In one form of the invention, the improved control is effected by providing the machine with at least one annular row of tandem airfoils, each consisting of a trailing vane and a fixed leading vane. The trailing vane and leading vane of the typical airfoil cooperatively define a gap whose width affects the boundary-layer flow over the airfoil and thus the gas-exist angle of the mainstream flow leaving the airfoil. The trailing vanes are affixed to a ring which is mounted for independent, arcuate movement about the axis of rotor rotation, so as to translate the trailing vanes circumferentially to alter the widths of their associated gaps. External means are provided for adjusting the position of the ring during operation of the machine in order to vary the gas-exist angles for the row of tandem airfoils and thereby control selected operating characteristics of the machine, such as suction volume or compression ratio.

19075 **(UCRL—15339) Development of manufacturing capability for the fabrication of the Nb_3Sn superconductor for the High Field Test Facility. Final report.** Spencer, C.R. (Airco Superconductors, Carteret, NJ (USA)). [nd]. Contract W-7405-ENG-48. 32p. NTIS, PC A03/MF A01.

Construction of High Field Test Facility (HFTF) at Lawrence Livermore Laboratory (LLNL) requires an extended surface Nb_3Sn superconductor cable of carrying currents in excess of 7500 amperes in a 12 Tesla magnetic field. This conductor consists of a 5.4 mm x 11.0 mm superconducting core onto whose broad surfaces are soldered embossed oxygen free copper strips. Two different core designs have been developed and the feasibility of each design evaluated. Equipment necessary to produce the conductor were developed and techniques of production were explored.

4203 Lasers

REFER ALSO TO CITATION(S) 19158, 19579, 19580

19076 (DOE/DP/40030—2, pp 4.1-4.51) **Laser and optics.** 1979. NTIS, PC A09/MF A01.

In Inertial fusion research. Annual technical report, 1979.

The following aspects of the Chroma I Nd glass laser system are discussed: (1) active mode locked oscillator, (2) disc amplifiers, (3) faraday rotators, (4) plasma spatial filter, (5) the triple bounce illumination system, (6) frequency doubling, and (7) output beam characterization. In addition, information on some of the advanced laser projects is given. (MOW)

19077 **(LA-UR—81-0020) Small-signal gain spectrum of an 1800-torr CO_2 amplifier.** Goldstein, J.C.; Haglund, R.F. Jr.; Comly, J. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 5p. (CONF-810613—3). NTIS, PC A02/MF A01.

From Conference on lasers and electro-optics; Washington, DC, USA (10 Jun 1981).

Prominent hot band effects have been observed in the 9.4 and 10.6 μm gain spectrum of an 1800 torr electron-beam-controlled-discharge CO_2 laser amplifier. Theoretical calculations agree well with data at 53 wavelengths.

19078 **(NRL-MR—4493) Numerical study of the nanosecond and subnanosecond performance of GEKKO XII-Module.** Lehmberg, R.H.; McMahon, J.M. (Naval Research Lab., Washington, DC (USA)). 23 Apr 1981. Contract AI01-77DP40042. 29p. NTIS, PC A03/MF A01.

A numerical study is conducted to examine the performance potential of the GEKKO XII-Module, a phosphate glass laser system currently under development at Osaka University. The study shows that with appropriate modifications, this system should produce peak powers up to 3.6 TW/beam in a 50 psec pulse, and 2 to 2.5 kJ/beam in a 1 nsec pulse. The similarity between the GEKKO XII-Module and Shiva beam line configurations suggests that a phosphate glass retrofit of Shiva could produce nanosecond pulse energies up to 50 kJ.

19079 **(UCID—18635) Double-sided electron-beam generator for KrF laser excitation.** Schlitt, L.; Swingle, J. (Lawrence Livermore National Lab., CA (USA)). May 1980. Contract W-7405-ENG-26. 14p. NTIS, PC A02/MF A01.

Several laser systems excited by electron beam have been identified as candidates for pump sources for laser fusion applications. The electron beam generators required must be compact, reliable and capable of synchronization with other system components. A KrF laser producing a minimum output of 25 J was needed for the RAPIER (Raman Amplifier Pumped by Intensified Excimer Radiation) system. A double-sided electron beam system was designed and constructed specifically for this purpose and has produced $>$ 35 J of KrF output. Each of the two electron beam machines in the system operates with an rms jitter of 0.4 ns and together occupy $\sim$ 3.5 m^2 of floor space. The successful operation of this laser has engendered requests for a description of the engineering details of this system. This document contains a brief description of the design issues and a full set of engineering drawings for this KrF laser amplifier.

19080 **(UCRL—53100) Physics of short-wavelength-laser design.** Hagelstein, P.L. (Lawrence Livermore National Lab., CA (USA)). Jan 1981. Contract W-7405-ENG-48. 452p. NTIS, PC A20/MF A01.

Thesis.

The physics and design of vuv and soft x-ray lasers pumped by ICF class high intensity infrared laser drivers are described (for example, the SHIVA laser facility at LLNL). Laser design and physics issues are discussed in the case of a photoionization pumping scheme involving Ne II and line pumping schemes involving H-like and He-like neon.

19081 **High efficiency laser spectrum conditioner.** Greiner, N.R. (to Department of Energy). US Patent 4,235,518. 25 Nov 1980. Filed date 4 Oct 1978. vp.

PAT-APPL-948375.

A high efficiency laser is described spectrum conditioner for generating a collinear parallel output beam containing a predetermined set of frequencies from a multifrequency laser. A diffraction grating and spherical mirror are used in combination, to disperse the various frequencies of the input laser beam and direct these frequencies along various parallel lines spatially separated from one another to an apertured mask. Selection of the desired frequencies is accomplished by placement of apertures at locations on the mask where the desired frequencies intersect the mask. A recollimated parallel output beam with the desired set of frequencies is subsequently generated utilizing a mirror and grating matched and geometrically aligned in the same manner as the input grating and mirror.

19082 **CO_2 optically pumped distributed feedback diode laser.** Rockwood, S.D. (to Department of Energy). US Patent 4,236,124. 25 Nov 1980. Filed date 3 Nov 1978. vp.

PAT-APPL-957631.

A diode laser optically pumped by a CO_2 coherent source is described. Interference fringes generated by feeding the optical

pumping beam against a second beam, periodically alter the reflectivity of the diode medium allowing frequency variation of the output signal by varying the impingent angle of the CO_2 laser beams.

19083 **Multistaged Stokes injected Raman capillary waveguide amplifier.** Kurnit, N.A. (to Department of Energy). US Patent 4,224,577. 23 Sep 1980. Filed date 3 Nov 1978. vp.

PAT-APPL-957630.

A multistaged Stokes injected Raman capillary waveguide amplifier for providing a high gain stokes output signal is described. The amplifier uses a plurality of optically coupled capillary waveguide amplifiers and one or more regenerative amplifiers to increase Stokes gain to a level sufficient for power amplification. Power amplification is provided by a multifocused Raman gain cell or a large diameter capillary waveguide. An external source of CO_2 laser radiation can be injected into each of the capillary waveguide amplifier stages to increase Raman gain. Devices for injecting external sources of CO_2 radiation include: dichroic mirrors, prisms, gratings and Ge Brewster plates. Alternatively, the CO_2 input radiation to the first stage can be coupled and amplified between successive stages.

4204 Heat Transfer And Fluid Flow

REFER ALSO TO CITATION(S) 18535, 19063, 19385

19084 **(DOE/PC/30303—T1) Effect of solid particles on the turbulent flow of a round gaseous jet: a mathematical and experimental study. Quarterly technical progress report, October 1-December 31, 1980.** Elghobashi, S. (California Univ., Irvine (USA)). Feb 1981. Contract FG22-80PC30303. 27p. NTIS, PC A03/MF A01.

Progress is reported in research on turbulent two-phase flow which occurs during the combustion of pulverized coal. Progress to date in the mathematical study includes derivation of the complete time-averaged conservation equations of the two-phase turbulent flow. These are the conservation equations of: continuity of the solid phase; momentum of the solid phase in the axial and radial directions; momentum of the gaseous phase in the axial and radial directions; turbulence kinetic energy; and dissipation rate of the turbulence kinetic energy. The experimental study included the design of the experimental apparatus, hardware fabrication, and the beginning of equipment assembly. (LCL)

19085 **(SAND—80-1558C) Multiphase-mixture theory for fluid-saturated granular materials.** Nunziato, J.W.; Passman, S.L. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 12p. (CONF-810524—1). NTIS, PC A02/MF A01.

From International symposium on mechanical behavior of structured media; Ottawa, CA, USA (18 May 1981).

The application of a recently developed theory of multiphase mixtures to fluid-saturated granular materials is discussed. The theory includes the incompressibility of each phase, but removes the constraint of pressure equilibrium between phases. The relationship between the present theory and previously developed models of flow through porous media is also discussed.

19086 **(SAND—80-1559C) Shearing flow of a fluid-saturated granular material.** Passman, S.L.; Nunziato, J.W. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 11p. (CONF-810524—2). NTIS, PC A02/MF A01.

From International symposium on mechanical behavior of structured media; Ottawa, CA, USA (18 May 1981).

A previously developed multiphase mixture theory is used to study the motion of a fluid-saturated granular material in a conventional viscometric simple shearing apparatus. It is shown that simple shearing generally does not occur. Typically, the shearing is concentrated in the vicinity of the boundaries, and the particles concentrate in the regions of low shearing. These results are consistent with experimental observations and other analytical studies of single particle motion in shearing flows.

4205 Materials Testing

REFER ALSO TO CITATION(S) 19182

19087 **(LA—8785-MS) Material density measurements from dynamic flash x-ray radiographs using axisymmetric tomography.** Fugelso, E. (Los Alamos Scientific Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 16p. NTIS, PC A02/MF A01.

The axisymmetric version of the tomographic x-ray reconstruction procedures has been utilized to determine the material density for the impact of a cylinder on a steel plate. Derivations of the reconstruction algorithms relating x-ray radiographic intensities to the material densities are presented. Effects of noise, point spread functions, and motion blur are minimized.

4208 Electronic Circuits And Devices

REFER ALSO TO CITATION(S) 19594

19088 **(CONF-810445—1) SEM/EDAX analysis of PIND test failures.** Dal Porto, J.F.; Loescher, D.H.; Olson, H.C.; Plunkett, P.V. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 4p. NTIS, PC A02/MF A01.

From International reliability physics symposium; Orlando, FL, USA (7 Apr 1981).

Packaged LSI and hybrid devices used in high reliability military and space applications must pass a rigorous series of screens defined by Method 5004 of Mil Standard 883B. One of these screens is the Particle Impact Noise Detection (PIND) test. This test uses a very sensitive acoustic transducer to listen for particles within the package while the package is vibrated and shocked. We have used SEM, EDAX, and optical microscopy to analyze the particles from PIND failures. From these analyses we have identified the primary sources of PIND failures and have developed procedures that yield a low reject rate at PIND test. The device used in this investigation was a 1 K RAM die eutectically attached to a 24-pin leadless hermetic package (LHP). The package is solder sealed in a belt furnace with a gold-tin eutectic preform and a gold-plated cover. We have recovered the particles from PIND test failures by placing lead tape over a punched hole in the gold plated Kovar lid. The package is then vibrated until the particles pass through the hole and are attached to the adhesive on the tape. From the analyses we have identified many sources of particles that cause PIND test failures; the main source being the gold-tin solder preform used in the sealing process. We have investigated the effect of sealing materials, furnace temperature, furnace ambient, and package orientation on the number of gold-tin solder spheres. The best results were obtained with a nonoxidizing furnace ambient with the packages placed lid down and angled at 45 degrees during sealing. These improved assembly processes have led to PIND test yields of better than 90%.

19089 **(SAND—81-0400) User/programmer guide for UCMD 49 thick-film resistor layout.** Wiegandt, K.E. (Sandia National Labs., Albuquerque, NM (USA)). Mar 1981. Contract AC04-76DP00789. 28p. NTIS, PC A03/MF A01.

An Applicon AGS/870-I User Command for parametrically constructing thick film resistor layouts of simple rectangular geometry is described.

19090 **(SAND—81-0426C) Testing methods for custom LSI circuits.** Graham, E.D. Jr. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 7p. (CONF-810533—1). NTIS, PC A02/MF A01.

From University/government/industry microelectronics symposium; State College, MS, USA (26 May 1981).

As the complexity and reliability requirements for modern integrated circuits increases, testing becomes more important. The various testing methodologies (manufacturer, user, commercial, and hi-rel), characterization schemes and equipment required, specified requirements for testing custom circuits, and projects testing trends through the mid eighties are discussed. The emphasis is on testing custom digital LSI circuits for application in hi-rel/military sys-

tems. (Extensive testing coupled with appropriate preconditioning is required if reliability of the component is to be assured.) The relationship between the required test vector set and the design engineering function is explored. Because of the prodigious amount of test data generated a display mechanism such as histogram or schmoo plot for data analysis is required. The use of schmoo plots and wafer mapping techniques for process/circuit fabrication control are described. Commonly used tester/testing terminology is defined and a discussion is presented regarding the complexity of test requirements associated with the popular device technologies (CMOS, MNOS, Linear, etc.). A brief survey of commercially available LSI test equipment is presented. Finally, the LSI Testing Complex at Sandia is described along with data analysis/reduction modes currently being applied.

19091 **(SAND—81-0569) Resistor pulse-handling capability.** Horner, L.E. (Sandia National Labs., Albuquerque, NM (USA)). Apr 1981. Contract AC04-76DP00789. 41p. NTIS, PC A03/MF A01.

Methods for calculating pulse-handling capabilities of various resistor types are described. The work represents a compilation of studies derived from various sources, as indicated in the bibliography. The results indicate that resistors may be subjected to short-duration pulses exceeding their rated powers without sustaining permanent damage.

19092 **(SAND—81-0945C) Hybrid microelectronics in severe temperature and radiation environments.** Palmer, D.W.; Draper, B.L.; Elliott, J.K. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 15p. (CONF-810533—2). NTIS, PC A02/MF A01.

From University/government/industry microelectronics symposium; State College, MS, USA (26 May 1981).

A JFET/thick film hybrid microcircuit technology tolerant to high temperatures and radiation has been developed at Sandia National Laboratories during the last 5 years. These hybrids function for 1000 hours at 300°C and have been tested to radiation levels of 1.4×10^9 rad gamma and 5×10^{15} neutrons/cm^2. High-temperature operation during irradiation should allow functionality to greater than 10^{10} rad gamma and 10^{16} n/cm^2. Related technologies are being incorporated in geophysical downhole instrumentation, jet engine monitors, nuclear reactor safety systems, and certain space probes. A survey of test results and a prediction of further obtainable tolerance are presented.

19093 **(SAND—81-0999C) Custom MOS LSI circuit design.** Gwyn, C.W. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 5p. (CONF-810529—1). NTIS, PC A02/MF A01.

From IEEE custom integrated circuits conference; Rochester, NY, USA (11 May 1981).

Sandia has developed a custom IC design capability to provide high-reliability, radiation-hardened custom circuits. This design capability relies on: computer aids to minimize design time and errors and to standardize the design process; the use of well-characterized cells and models; a close adherence to a list of practical design guidelines; and a close working relationship with the customer and processing laboratory. The formal design guidelines advocate design for testability, producibility, radiation hardness, and reliability. Prototype and production quantities of custom radiation-hardened ICs are fabricated in the Center for Radiation-Hadened Microelectronics (CRM) Semiconductor Development Laboratory.

19094 **(UCRL—85276) Design of 2-D rational digital filters.** Harris, D.B. (Lawrence Livermore National Lab., CA (USA)). 1981. Contract W-7405-ENG-48. 6p. (CONF-810310—2). NTIS, PC A02/MF A01.

From IEEE international conference on acoustics, speech and signal processing; Atlanta, GA, USA (30 Mar 1981).

A novel 2-D rational filter design technique is presented which makes use of a reflection coefficient function (RCF) representation for the filter transfer function. The design problem is formulated in the frequency domain. A least-square error criterion is used though the usual error measure is augmented with barrier functions. These act to restrict the domain of approximation to the set of stable filters. Construction of suitable barrier functions is facilitated by the RCF characterization.

19095 **Automatic sweep circuit.** Keefe, D.J. (to Department of Energy). US Patent 4,236,067. 25 Nov 1980. Filed date 16 Nov 1978. vp.

PAT-APPL-961153.

An automatically sweeping circuit for searching for an evoked response in an output signal in time with respect to a trigger input is described. Digital counters are used to activate a detector at precise intervals, and monitoring is repeated for statistical accuracy. If the response is not found then a different time window is examined until the signal is found.

19096 **Multiplexer and time duration measuring circuit.** Gray, J.J. (to Department of Energy). US Patent 4,234,949. 18 Nov 1980. Filed date 10 Apr 1979. vp.

PAT-APPL-028741.

A multiplexer device is provided for multiplexing data in the form of randomly developed, variable width pulses from a plurality of pulse sources to a master storage. The device includes a first multiplexer unit which includes a plurality of input circuits each coupled to one of the pulse sources, with all input circuits being disabled when one input circuit receives an input pulse so that only one input pulse is multiplexed by the multiplexer unit at any one time.

4209 Waste Processing Plants And Equipment

REFER ALSO TO CITATION(S) 18905

4210 Combustion Systems

REFER ALSO TO CITATION(S) 17907, 17908, 17963, 18860

19097 **(DOE/ET/20058—T1) Development of wood as an alternative fuel for large power generating systems.** (Aerospace Research Corp., Roanoke, VA (USA)). 1979. Contract AC05-78ET20058. 22p. NTIS.

Variations in secondary air whirl intensity, mixing duct length, burning rate, and wood particle size with various species of wood have been investigated in the small combustion module constructed in phase I. Further tests were conducted in a large scale furnace that was constructed for determination of scale effects. The large scale furnace was designed for green wood feeds ranging from 15,000 to 30,000 lbs per hour. Descriptions of the test apparatus and modifications that were made during the course of the investigations are presented. Method of wood preparation, procedures, experimental results, and discussions of each are also presented. A survey was made to find potential users of the methods developed. The results of the survey are included. (MHR)

19098 **(DOE/PC/30296—2) Advanced pulverized-coal combustor for control of NO/sub x/ emissions. Second quarterly report, December 25, 1980-April 3, 1981.** Pam, R.L.; Suttmann, S.T.; Kelly, J.T.; Chu, E.K. (Acurex Corp., Mountain View, CA (USA). Energy and Environmental Div.). 1981. Contract AC22-80PC30296. 26p. NTIS, PC A03/MF A01.

Second quarter results under the Advanced Pulverized Coal Combustor for Control of NO/sub x/ Emissions Program are reported. The program uses an idealized one-dimensional combustor, incorporating fuel staging. A comprehensive computer model is being developed under the program to allow NO mechanisms and rates to be extracted from the experimental data. During the quarter, modification of the existing PROF code to include particle effects was begun. Various aspects of the solution procedure are described in this report. Refinements in the kinetic thermochemical data are completed, providing satisfactory agreement between calculated NO predictions and selected experimental data. Combustor mechanical design was described last quarter. The heat transfer analysis used in the design of the combustor is reported herein. Initial combustion tests will be run next quarter.

19099 **(DOE/PC/30297—T2) Assessment of pulverized-coal-fired combustor performance. Models for coal-combustor performance: analytical tool verification.** Richter, W. (Energy and Environmental Research Corp., Santa Ana, CA (USA)). Feb 1981. Contract AC22-80PC30297. 96p. NTIS, PC A05/MF A01.

The development of mathematical models that describe the complex heat transfer processes which occur in industrial combustion chambers is discussed. These combustor models are grouped as either pure heat transfer models or as coupled fluid flow, combustion, and heat transfer models. Two models of the first type and one of the second type are described together with some basic assumptions and sample problems which illustrate their major features and capabilities. (LCL)

19100 **(DOE/SF/10538—T8(Vol.1)) Studies on advanced overseas energy technologies. Volume I. Final report.** Straus, R.W.; Thurman, R.S.; Carsey, J.N. (Galaxy, Inc., Washington, DC (USA)). Mar 1981. Contract AC03-79SF10538. 124p. NTIS, PC A06/MF A01.

A final evaluation is presented covering investigations performed over the past 5 years to perceive energy conversion technology and covering over 100 advanced energy technologies which saw many new developments in energy conversion in the countries studied. Specifically, the state-of-the-art for specified technologies and the development of energy technologies overseas are discussed. The development of combustion technology in Sweden, Denmark, Finland, France, Netherlands, Italy, Spain, Portugal, Japan, Norway, and the Federal Republic of Germany is summarized. (MCW)

19101 **Mathematical modeling of fluidized-bed combustors.** Olofsson, J. London, England; IEA Coal Research (1980). 100p. (ICTIS/TR—14).

The principles of mathematical modeling of fluidized-bed coal combustors are stated. This includes the formulation of the mass and heat balances, and the discussion of a number of model elements describing various phenomena occurring in fluidized-bed coal combustors. Examples of existing models are reviewed. Based on this review recommendations for future activities in the field of FBC-modeling are given.

4220 Underground Engineering

19102 **Pressure charged airlift pump.** Campbell, G.K. (to Dept. of Energy). US Patent Application 178,653. 15 Aug 1980. 11p.

A pumping system is described for pumping fluids, such as water with entrained mud and small rocks, out of underground cavities such as drilled wells, which can effectively remove fluids down to a level very close to the bottom of the cavity and which can operate solely by compressed air pumped down through the cavity. The system utilizes a subassembly having a pair of parallel conduit sections adapted to be connected onto the bottom of a drill string utilized for drilling the cavity, the drill string also having a pair of coaxially extending conduits. The subassembly includes an upper portion which has means for connection onto the drill string and terminates the first conduit of the drill string in a plenum. A compressed air-driven pump is suspended from the upper portion. The pump sucks fluids from the bottom of the cavity and discharges them into the second conduit. Compressed air pumped down through the first conduit to the plenum powers the compressed air-driven pump and aerates the fluid in the second conduit to lift it to the earth's surface.

4230 Marine Engineering

REFER ALSO TO CITATION(S) 19421, 19422

4240 Pollution Control Equipment

REFER ALSO TO CITATION(S) 18544, 19066, 19196

19103 (LMF—84, pp 286-289) **High volume size selective aerosol sampling system for an experimental fluid bed coal combustor.** Carpenter, R.L.; Newton, G.J.; Barr, E.B. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

A high volume size-selective aerosol sampling system has been designed, built, tested and used to obtain aerosol samples from the Morgantown Energy Technology Center (METC) Fluidized Bed Coal Combustor (FBC). This sampling system complements a previously developed analytical system and provides larger quantities of effluent material for biological testing. The system consists of a high volume filter and two types of high volume slit jet cascade impactors. Maximum sampling rates exceed the total air flow from the FBC. Sample size ranged from a few milligrams for size selected samples to about 20 grams for filter samples. Bypassing the baghouse, filter on the FBC increased potential mass loading of samples from 0.01 to about 1 g/m^3.

4250 Power Cycles

REFER ALSO TO CITATION(S) 18331

43 PARTICLE ACCELERATORS

4302 Beam Dynamics, Field Calculations, And Ion Optics

REFER ALSO TO CITATION(S) 19138

19104 **(BNL—29199) Heavy-ion injection from tandems into an isochronous cyclotron.** LeVine, M.J.; Chasman, C. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 5p. (CONF-810314—116). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

A design has been realized for the injection of heavy ion beams generated by the BNL 3-stage tandem facility into a proposed isochronous cyclotron. The tandem beams are bunched into +- 1° R.F. phase (≦ 0.5 nsec) in two stages. The beam is then injected into the cyclotron through a valley, past a hill, and into the next valley on to a stripper foil. Only a single steerer is required to make trajectory corrections for the different beams. Two achromats are used to regulate the tandem potential and to provide phase control. A final section of the injection optics provides matching of transverse phase space to the acceptance of the cyclotron. The calculations use realistic tandem emittances and magnetic fields for the cyclotron based on measurements with a model magnet.

19105 **(BNL—29302) Longitudinal instabilities in circular accelerator and storage rings.** Pellegrini, C. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 7p. (CONF-810314—109). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The general problem of the longitudinal stability of bunched beams is reviewed. Although there is no general solution it is possible to identify regions in the frequency-risetime space where we can obtain approximate solutions. The collective oscillation frequency is written, and expressions for the effective coupling impedance are given for the high or low frequency and slow and fast blow-up regimes.

19106 **(BNL—29329) Laser-driven electron accelerators.** Palmer, R.B. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 6p. (CONF-810314—110). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The following possibilities are discussed: inverse free electron laser (wiggler accelerator); inverse Cerenkov effect; plasma accelerator; dielectric tube; and grating linac. Of these, the grating acceleraton is considered the most attractive alternative. (GHT)

19107 **(FERMILAB-CONF—81/29-THY) Colliding beams: what is an appropriate mathematical approach.** Schonfeld, J.F. (Fermi National Accelerator Lab., Batavia, IL (USA)). 1981. Contract AC02-76CH03000. 8p. (CONF-810356—1). NTIS, PC A02/MF A01.

From Workshop on long-time prediction in nonlinear conservative dynamical systems; Austin, TX, USA (16 Mar 1981).

The success of notions of self-similarity in the analysis of certain one-dimensional iterative systems related to turbulent flow encourages us to seek applications of such notions to the analysis of the higher-dimensional conservative systems corresponding to colliding-beam storage rings. This may yield information inaccessible to the resonance-overlap criterion, and may be of greater relevance to observed phenomena.

19108 **(LBL—11741) Study of the beam breakup mode in linear induction accelerators for heavy ions.** Chattopadhyay, S.; Faltens, A.; Smith, L. (Lawrence Berkeley Lab., CA (USA)). Mar 1981. Contract W-7405-ENG-48. 4p. (CONF-810314—125). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

A simple theoretical study and numerical estimate is presented for the transverse amplitude growth of a nonrelativistic heavy ion beam in an induction linac, as envisaged for use in commercial power plants, due to the nonregenerative coherent beam breakup mode. An equivalent electrical circuit has been used to represent the accelerating induction modules. Our calculation shows that for the parameters of interest, the beam breakup amplitude for a heavy ion beam grows extremely slowly in the time scales of interest, to magnitudes insignificant for transport purposes. It is concluded that the coherent beam breakup mode does not pose any serious threat to the stability of a high current (kA) heavy ion beam in an induction linac.

19109 **(LBL—11743) Permanent magnet undulator for SPEAR.** Halbach, K.; Chin, J.; Hoyer, E.; Winick, H.; Cronin, R.; Yang, J.; Zambre, Y. (Lawrence Berkeley Lab., CA (USA); Stanford Univ., CA (USA). Stanford Synchrotron Radiation Lab.). Mar 1981. Contract W-7405-ENG-48. 7p. (CONF-810314—115). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

A 30 period permanent magnet ($SmCo_5$) undulator has been designed, built and tested. The period is 6.1 cm, overall length is 1.95 m, and the gap is variable from 2.7 cm to 6.0 cm. Magnetic measurements at the midplane with a 2.7 cm gap show that the field is sinusoidal with a peak value of .28 T. Construction details and magnetic measurements are presented along with the spectral distribution of radiation produced by 3.0 GeV electrons traversing the undulator.

19110 **(LBL—11748) Stochastic cooling of bunched beams.** Bisognano, J.J.; Chattopadhyay, S. (Lawrence Berkeley Lab., CA (USA)). Mar 1981. Contract W-7405-ENG-48. 5p. (CONF-810314—121). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

Numerical simulation studies are presented for transverse and longitudinal stochastic cooling of bunched particle beams. Radio frequency buckets of various shapes (e.g. rectangular, parabolic well, single sinusoidal waveform) are used to investigate the enhancement of phase space cooling by nonlinearities of synchrotron motion. The connection between the notions of Landau damping for instabilities and mixing for stochastic cooling are discussed. In particular, the need for synchrotron frequency spread for both Landau damping and good mixing is seen to be comparable for bunched beams.

19111 **(LBL—11750) Transverse-longitudinal coupling in intense beams.** Wang, T.S.F.; Smith, L. (Lawrence Berkeley Lab., CA (USA)). Mar 1981. Contract W-7405-ENG-48. 5p. (CONF-810314—123). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The coupling between transverse and longitudinal perturbations is studied self-consistently by considering a beam of K-V distribution. The analysis is carried out within the context of linearized Vlasov-Maxwell equations and electrostatic approximation. The perturbation is assumed to be azimuthally symmetric but axially non-uniform (k/sub z/ is not equal to 0). It is shown that the coupling affects both the longitudinal and transverse modes significantly in the high density and low frequency region. Two new classes of longitudinal modes are found which would not exist if the transverse motions of particles are neglected. The effect of resistive wall impedance on beam stability is also studied. It is found that the longitudinal impedance can cause the transverse modes also to be weakly unstable.

19112 **(SLAC-PUB—2680) Estimate of coherent tune shifts for PEP.** Yao, C.Y.; Chao, A.W. (Stanford Linear Accelerator Center, CA (USA)). Feb 1981. Contract AC03-76SF00515. 3p. (CONF-810314—111). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

Transverse and longitudinal instabilities for a bunched PEP beam with a Gaussian distribution are treated using the standard technique in which instability problems are solved by looking for eigenvalues of the linearized Vlasov equation. The eigen solutions are conveniently expanded in terms of the Laquerre polynomials, and the eigenvalues are given by a symmetric matrix whose elements can be expressed in infinite series. The well-known formalism is used to obtain the matrix formula, and then applied numerically to the PEP ring to estimate the transverse coherent tune shifts. The impedance used is that estimated for the PEP RF cavities. The agreement with experimental data seems reasonable.

19113 **Electrostatic quadrupole array for focusing parallel beams of charged particles.** Brodowski, J. (to Dept. of Energy). US Patent Application 179,918. 20 Aug 1980. 11p.

An array of electrostatic quadrupoles, capable of providing strong electrostatic focusing simultaneously on multiple beams, is easily fabricated from a single array element comprising a support rod and multiple electrodes spaced at intervals along the rod. The rods are secured to four terminals which are isolated by only four insulators. This structure requires bias voltage to be supplied to only two terminals and eliminates the need for individual electrode bias and insulators, as well as increases life by eliminating beam plating of insulators.

19114 **Neutral beamline with ion energy recovery based on magnetic blocking of electrons.** Stirling, W.L. (to Dept. of Energy). US Patent Application 164,990. 1 Jul 1980. 18p.

A neutral beamline generator with energy recovery of the full-energy ion component of the beam based on magnetic blocking of electrons is provided. Ions from a positive ion source are accelerated to the desired beam energy from a slightly positive potential level with respect to ground through a neutralizer cell by means of a negative acceleration voltage. The unneutralized full-energy ion component of the beam exiting the neutralizer are retarded and slightly deflected and the elecrons in the neutralizer are blocked by a magnetic field generated transverse to the beamline. An electron collector in the form of a coaxial cylinder surrounding and protruding axial a few centimeters beyond the neutralizer exit terminates the electrons which exit the neutralizer in an E x B drift to the collector when the collector is biased a few hundred volts positive with respect to the neutralizer voltage. The neutralizer is operated at the negative acceleration voltage. The neutralizer is operated at the negative acceleration voltage, and the deflected full energy ions are decelerated and the charge collected at ground potential thereby expending none of their energy received from the acceleration power supply.

4303 Auxiliaries And Components

REFER ALSO TO CITATION(S) 19062, 19467, 19473

19115 (ANL—80-94, pp 121-134) **Superconducting Linac.** Benaroya, R.; Bollinger, L.M.; Pardo, R.C.; Shepard, K.W.; Aron, J.; Clifft, B.E.; Johnson, K.W.; Markovich, P.; Nixon, J.M. 1980. NTIS, PC A12/MF A01.

In Physics Division annual review, 1 April 1979-31 March 1980.

The Superconducting Linac Project has two main components, both of which are developmental in nature. One is the specific task of designing, building, and testing a small superconducting linac to serve as an energy booster for heavy ions from the FN tandem electrostatic accelerator. The second, more general part, consists of investigations of various aspects of superconducting rf technology. Although most of these investigations are now aimed at the immediate needs of the booster, many of them are of fairly general interest for accelerator technology.

19116 (ANL—80-94, pp 135-156) **Accelerator operations.** 1980. NTIS, PC A12/MF A01.

In Physics Division annual review, 1 April 1979-31 March 1980.

This section is concerned with the operation of both the tandem-linac system and the Dynamitron, two accelerators that are used for entirely different research. Developmental activities associated with the tandem and the Dynamitron are also treated here, but developmental activities associated with the superconducting linac are covered separately because this work is a program of technology development in its own right.

19117 (ANL—80-94, pp 157-162) **GeV electron microtron.** 1980. NTIS, PC A12/MF A01.

In Physics Division annual review, 1 April 1979-31 March 1980.

A strong consensus has developed recently in the nuclear physics community that research with electromagnetic probes in the 1 to 2 GeV range generated by a high current 100% duty factor electron accelerator represents an exciting new frontier. Because of this rapidly growing interest, a design group of 5 ANL physicists and accelerator specialists recently reviewed developments in accelerator technology and developed conceptual designs for technical evaluation and subsequent cost analysis. Exploratory designs were developed for two concepts, the linac-stretcher ring and a modified microtron system. These were used to make a critical comparison of the two conceptual designs along with an improved microtron design, the double-sided microtron. The results are presented in Table VIII-I. The double-sided microtron shows promise for development into a substantially less expensive facility than a linac-ring system, but its technical feasibility remains to be established. The potential savings in capital cost are large for the microtron system, perhaps $10 million. They dictate that in the absence of a major technical limitation the double-sided microtron is the preferred design.

19118 **(BNL—29317) Design and test results of a pulsed quadrupole magnet with a 2 μs rise time.** Bywater, J.A.; Lari, R.J.; Ratner, L.G.; Lee, Y.Y.; Fujisaki, M.; Krisch, A.D.; Terwilliger, K.M. (Argonne National Lab., IL (USA); Brookhaven National Lab., Upton, NY (USA); Michigan Univ., Ann Arbor (USA)). 1981. Contract AC02-76CH00016. 4p. (CONF-810340—4). NTIS, PC A02/MF A01.

From 7. international conference on magnet technology; Karlsrube, F.R. Germany (30 Mar 1981).

Major polarization losses will be encountered during acceleration of polarized protons in the Brookhaven AGS due to eight intrinsic depolarizing resonances. Pulsing a set of 12 vertical tune shift quadrupole magnets with a 2 μs rise time, 3 ms fall, and 60 ms repetition rate should reduce these losses. This requires a gradient of 1.87 T/M over the 8.89 x 12.7 cm vacuum chamber. A ferrite core quadrupole magnet has been designed, built, and magnetically measured. The pole tip has a hyperbolic shape and the coil consists of four parallel 0.318 cm by 0.453 cm turns per pole. This approximates a current sheet 0.318 cm thick and curves to lie along a flux line. Placed as close to the vacuum chamber as possible, it minimizes the inductance of the magnet and the voltage of the power supply. Proper spacing of the four turns assures a more uniform gradient over a large aperture. Two slabs of ferrite are bonded together and machined to form one pole of half length. These are bonded end-to-end, and a prewound coil on a fiberglass support is attached. Four such pole assemblies are then assembled around the vacuum chamber and electrically connected together. The design, construction, and measurements are presented.

19119 (BNL—51115(Vol.1), pp 307-324) **MSU superconducting cyclotron project.** Au, R.; Bellomo, G.; Blosser, H. (Michigan State Univ., East Lansing). Nov 1979. NTIS, PC A21/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

The Cyclotron Laboratory at MSU is in the process of designing and constructing a large double cyclotron system for the purpose of providing high quality beams of heavy ions with energies up to 200 MeV per nucleon for lighter heavy ions such as calcium and up to 20 MeV per nucleon for the heaviest particles such as uranium. The 500 MeV first stage cyclotron is at present in the final year of its construction phase; funding for the second stage cyclotron and for a large expansion of experimental facilities and building is expected in fiscal year 1980. The project has been described in a number of previous publications. A broad overview of the project is presented here in a brief form along with a statement of project status as of July 1979.

19120 (BNL—51115(Vol.1), pp 365-404) **Use of a streamer chamber at intermediate energies.** Van Bibber, K.; Pang, W.; Avery, M. (Univ. of California, Berkeley). Nov 1979. NTIS, PC A21/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

Basic experiences with a small streamer chamber designed and built at the Lawrence Berkeley Laboratory 88-inch cyclotron for surveying the topology of heavy ion reactions between 10 and 35 MeV/A are reviewed. An attempt is made to portray its future for low energy work in a realistic way, but more importantly what we foresee as its capability for the truly intermediate energy regime, ~ 50 to 200 MeV/A.

19121 (BNL—51115(Vol.2), pp 501-511) **Chalk River superconducting cyclotron.** Heighway, E.A.; Bigham, C.B.; Hoffmann, C.R.J.; Hulbert, J.A.; Ormrod, J.H.; Schneider, H.R.; Walker, Q.A. (Atomic Energy of Canada, Ltd., Chalk River, Ontario). Nov 1979. NTIS, PC A22/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

The proposed heavy ion research facility at Chalk River consists of a 13 MV MP tandem accelerator with a K = 520 superconducting cyclotron operating as a post-accelerator. Briefly the cyclotron is a four sector isochronous cyclotron with accelerating dees in each valley, two on each of two resonators on the cyclotron axis. Isochronism is provided by altering the current in two main magnet coils with fine tuning provided by trim rods.

19122 (BNL—51115(Vol.2), pp 627-633) **Present stage of reflection concerning the usefulness of a magnetic spectrometer at Ganil.** Coffin, J.P. (Strasbourg-1 Univ., France). Nov 1979. NTIS, PC A22/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

The problem of the usefulness of a magnetic specrometer for a heavy ion accelerator like Ganil is a delicate one which has been under study for about two years. This report gives a brief summary of the stage of reflection as it stands today.

19123 (BNL—51115(Vol.2), pp 635-653) **A K = 800 high resolution heavy ion spectrograph.** Nolen, J.A. Jr. (Michigan State Univ., East Lansing). Nov 1979. NTIS, PC A22/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

This is a progress report on design considerations for a large heavy ion spectrograph to be used with MSU Phase II. A prelimi-

nary sketch indicating the position of the K = 800 spectrograph on the floor plan of the new heavy ion laboratory is shown. Although the spectrograph design presented here is rather detailed, it is only intended to be suggestive and a focal point for discussion by the sponsors group and prospective users of the facility. First the need for such a spectrograph and the choice of parameters such as energy and angular resolution are outlined, and then the choice of optical mode for the system is discussed. Finally, a preliminary design of a particular beam transport-spectrograph combination is presented.

19124 (BNL—51115(Vol.2), pp 655-672) **Reaction product mass spectrograph for intermediate energies.** Harwood, L.H. (Michigan State Univ., East Lansing). Nov 1979. NTIS, PC A22/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

One of the major areas of use for any accelerator in the 10-200 MeV/nucleon energy range will be in production of new nuclei far from β-stability or in the superheavy mass region. A device which can measure the mass of these nuclei directly as they are emitted from the target would be extremely useful. During the past several months several designs for such a reaction product mass spectrograph (RPMS) to be used with the MSU superconducting cyclotrons have been studied. Details of the current plans of a system which appears potentially useful over a wide (1 to 200 MeV/nucleon) energy range are given.

19125 **(LA—8736-PR) Accelerator Technology Program. Progress report, January-June 1980.** Knapp, E.A.; Jameson, R.A. (Comps.). (Los Alamos National Lab., NM (USA)). Mar 1980. Contract W-7405-ENG-36. 165p. NTIS, PC A08/MF A01.

The activities of Los Alamos Scientific Laboratory's (LASL) Accelerator Technology (AT) Division during the first six months of calendar 1980 are discussed. This report is organized around major projects of the Division, reflecting a wide variety of applications and sponsors. The first section summarizes progress on the Proton Storage Ring to be located between LAMPF and the LASL Pulsed Neutron Research facility, followed by a section on the gyrocon, a new type of high-power, high-efficiency radio-frequency (rf) amplifier. The third section discusses the racetrack microtron being developed jointly by AT Division and the National Bureau of Standards; the fourth section concerns the free-electron studies. The fifth section covers the radio-frequency quadrupole linear accelerator, a new concept for the acceleration of low-velocity particles; this section is followed by a section discussing heavy ion fusion accelerator development. The next section reports activities in the Fusion Materials Irradiation Test program, a collaborative effort with the Hanford Engineering Development Laboratory. The final section deals first with development of H^- ion sources and injectors, then with accelerator instrumentation and beam dynamics.

19126 **(LA—8768-PR) Progress at LAMPF: Clinton P. Anderson Meson Physics Facility. Progress report, July-December 1980.** Allred, J.C. (ed.). (Los Alamos National Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 151p. NTIS, PC A08/MF A01.

Progress at LAMPF is the semiannual progress report of the MP Division of the Los Alamos National Laboratory. The report also includes brief reports on research done at LAMPF by researchers from other institutions and Los Alamos divisions.

19127 **(LA-UR—81-973) High-current density coils for high-radiation environments.** Harvey, A. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 5p. (CONF-810340—5). NTIS, PC A02/MF A01.

From 7. international conference on magnet technology; Karlsrube, F.R. Germany (30 Mar 1981).

This paper concentrates on the problems of providing normal (that is, nonsuperconducting) magnet coils for present and short-term-future requirements where significant radiation doses are involved. Projects such as 100-mA deuteron accelerators and bundle diverter coils for TOKAMAKS are typical of applications where conventional organic insulation limited to 10^{10} rads makes epoxy-based systems unacceptable. Moreover, even in present-day accelerators, radiation levels can be high enough to give rise to problems with oxidation of copper conductors if water is used in direct contact with the copper. The radiolytic oxygen, being formed in situ, cannot be controlled by external deoxygenators. An acceptable insulation for such environments has been described previously, and is being employed where radiation is expected to be a problem. Being a compacted magnesium oxide powder, the insulation has advantages. Analysis of constraints on maximum current densities achievable in such a coil construction, using computer codes, leads to coil configurations that operate at higher current densities than are usually found in directly cooled coils. An example of the thermal analysis of one coil configuration is given. The problems are addressed here.

19128 **(LA-UR—81-1010) Neutrino oscillation experiments at LAMPF.** Burma, R.L. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 19p. (CONF-810135—2). NTIS, PC A02/MF A01.

From Neutrino oscillation workshop; Upton, NY, USA (30 Jan 1981).

The high flux of neutrinos available at the LAMPF linac beam stop has been used to search for neutrino oscillations and neutrino disappearance. Past and present experiments at the facility are described. (GHT)

19129 **(LASL—81-6(Mini-Review)) PIGMI: a pion generator for medical irradiations.** Swenson, D.A. (Los Alamos National Lab., NM (USA)). Feb 1981. Contract W-7405-ENG-36. 4p. NTIS, PC A02/MF A01.

PIGMI is described. All the technologies have been developed or identified. These technologies give rise to a new breed of proton linacs that will be reliable, modular, easy to maintain, and easy to operate. These new linacs will find numerous applications in both medicine and nuclear science. Medical applications will include pion generation, neutron generation, radioisotope production, and proton beams for diagnosis and treatment. When combined with an electron beam ion source (EBIS), PIGMI yields the very attractive heavy-ion acceleration scheme called HIGMI. PIGMI offers to nuclear science economical sources of medium-energy protons at medium intensity and, if used with storage rings, also offers both long and very short pulses.

19130 **(LBL—11693) LBL Wideroe-based heavy ion injector project.** Staples, J.W.; Lancaster, H.D.; Yourd, R.B. (Lawrence Berkeley Lab., CA (USA)). Mar 1981. Contract W-7405-ENG-48. 5p. (CONF-810314—112). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The LBL Wideroe-based high-intensity heavy-ion injector for the SuperHILAC will be operational by April 1981. It will provide several emA of low charge state ions up through uranium at high duty factor to the SuperHILAC. Several of the subsystems have already operated to specification and will be described.

19131 **(LBL—11714) Unique space saving accelerator cavity design.** Kim, H.; Fugitt, J.; Crosby, F.; Johnson, R. (Lawrence Berkeley Lab., CA (USA)). Mar 1981. Contract W-7405-ENG-48. 5p. (CONF-810314—113). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

A cavity with 3 series gaps was designed and modeled to operate at 70 MHz as a SuperHILAC post acceleration buncher (8.5 MeV/A). Because of a cross-coupling scheme, the 3 cells operate in the 1/2 $\beta\lambda$ mode instead of the $\beta\lambda$ mode of an Alvarez cavity. This coupling results in a cavity with diameter reduced from 3 to less than one meter and a length half that of an Alvarez cavity for the same energy gain. The 3 gaps are electrically in parallel but mechanically in series. The cavity has high Q and shunt impedance. This type of cavity appears to be useful for low velocity beams with $\beta \leqq 0.2$.

19132 (LBL—11718) Heavy ion beam studies and imaging with a multiplane multiwire proportional chamber. Chu, W.T.; Alonso, J.R.; Tobias, C.A. (Lawrence Berkeley Lab., CA (USA)). Mar 1981. Contract W-7405-ENG-48. 5p. (CONF-810314—114). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

A 16-plane multiwire proportional chamber is used to accurately measure intensity profiles of heavy ion beams at the Bevalac. An imaging capability has now been developed for the system, allowing for reconstruction of 3-dimensional representation of radiological objects using heavy ion beams.

19133 (LBL—11744) Comparison of the costs of superconducting accelerator dipoles using NbTi, Nb_3Sn and NbTiTa. Hassenzahl, W. (Lawrence Berkeley Lab., CA (USA)). Mar 1981. Contract W-7405-ENG-48. 5p. (CONF-810314—119). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The present study, which is based on the assumption that future, high-energy accelerators will use superconductors, is a comparison of the costs of 5 to 12 Tesla NbTi, Nb$_3$S/sub n/, and NbTiTa accelerator magnets operating at 4.2 K or 1.8 K. The object of this evaluation is not to determine the actual cost of future accelerators, rather, its purpose is to provide some rationale for research on the next generation of superconducting accelerator magnets. Thus, though the actual costs of accelerator magnets may be different from those given here, the comparisons are valid.

19134 (LBL—11752) Novel epoxy-free construction method for fabricating dipole magnets and test results. Taylor, C.; Althaus, R.; Caspi, S.; Gilbert, W.S.; Hassenzahl, W.; Meuser, R.; Rechen, J.; Warren, R. (Lawrence Berkeley Lab., CA (USA)). 1981. Contract W-7405-ENG-48. 5p. (CONF-810314—122). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

Three model superconducting dipole magnets, lm length and having a bore diameter of 76mm, fabricated without epoxy resins or other adhesives, have been built and the first two have been tested in He I and He II. The conductor is the 23-strand Rutherford-type cable used in the Fermilab Doubler/Saver magnets, and is insulated with Mylar and Kapton. The two-layer winding is highly compessed by a system of structural support rings and tapered collets. Little training was required. Quench currents greater than 95% of short sample were obtained in He I with rise-times of 15 to 20 seconds to a central field of 4.6 T; 6.0 T in Helium II.

19135 (LBL—12233) Quench protection and design of large high-current-density superconducting magnets. Green, M.A. (Lawrence Berkeley Lab., CA (USA)). Mar 1981. Contract W-7405-ENG-48. 10p. (CONF-810340—6). NTIS, PC A02/MF A01.

From 7. international conference on magnet technology; Karlsrube, F.R. Germany (30 Mar 1981).

Although most large superconducting magnets have been designed using the concept of cryostability, there is increased need for large magnets which operate at current densities above the cryostable limit (greater than 10^8 Am^{-2}). Large high current density superconducting magnets are chosen for the following reasons: reduced mass, reduced coil thickness or size, and reduced cost. The design of large high current density, adiabatically stable, superconducting magnets requires a very different set of design rules than either large cryostable superconducting magnets or small self-protected high current density magnets. The problems associated with large high current density superconducting magnets fall into three categories; (a) quench protection, (b) stress and training, and (c) cryogenic design. The three categories must be considered simultaneously. The paper discusses quench protection and its implication for magnets of large stored energies (this includes strings of smaller magnets). Training and its relationship to quench protection and magnetic strain are discussed. Examples of magnets, built at the Lawrence Berkeley Laboratory and elsewhere using the design guidelines given in this report, are presented.

19136 (LBL—12263) Accelerator and Fusion Research Division annual report, fiscal year 1980, October 1979-September 1980. (Lawrence Berkeley Lab., CA (USA)). Mar 1981. Contract W-7405-ENG-48. 119p. NTIS, PC A06/MF A01.

Research during October 1979 to September 1980 is summarized. Areas covered include: accelerator operations; positron-electron project; stochastic beam cooling; high-field superconducting magnets; accelerator theory; neutral beam sources; and heavy ion fusion. (GHT)

19137 (LBL—12456) Prospects for 10T accelerator dipole magnets. Taylor, C.E.; Meuser, R.B. (Lawrence Berkeley Lab., CA (USA)). Mar 1981. Contract W-7405-ENG-48. 8p. (CONF-810314—117). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

A next-generation major accelerator will require the highest possible field to minimize the circumference; however, there have been no proven designs for suitable magnets with fields substantially higher than 5T. A number of successful 4 to 5T dipole magnets have been built in recent years; these have involved long and difficult development projects. The 3″ bore 4.25T magnets for the Doubler are being produced by the hundreds at Fermilab, and a number of prototypes of the 5.2″ bore 5T ISABELLE magnets have been built. Successful short, ~ 5T models have been made at SACLAY, KEK, and Serpukhov, and a number of model magnets with lower fields have been built at many laboratories. Field uniformity achieved in these magnets is about $\Delta B/B \cong 10^{-3}$. 10T magnets with higher field uniformity will be a challenging development task. The general problems of high-field (10T) magnets are discussed in terms of superconductor performance and mechanical limitations.

19138 (SAND—80-1969) Ion beam characteristics of the controlatron/zetatron family of the gas filled neutron tubes. Berg, R.S.; Shope, L.A.; O'Neal, M.L.; Boers, J.E.; Bickes, R.W. Jr. (Sandia National Labs., Albuquerque, NM (USA)). Mar 1981. Contract AC04-76DP00789. 21p. NTIS, PC A02/MF A01.

A gas filled tube used to produce a neutron flux with the D(T,He^4)n reaction is described. Deuterium and tritium ions generated in a reflex discharge are extracted and accelerated to 100 keV by means of an accelerator electrode onto a deutero-tritide target electrode. The electrodes are designed to focus the ion beam onto the target. Total tube currents consisting of extracted ions, unsuppressed secondary electrons, and ions generated by interactions with the background gas are typically 100 mA. The characteristics of the extracted ion beam are discussed. Accelerating voltages greater than 50 kV are required to focus the beam through the accelerator aperture for configurations that give beams with the proper energy density onto the target. The perveance of the beam is discussed. Maximum perveance values are 2 to 20 nanopervs. Tube focusing and neutron production characteristics are described.

19139 (SLAC-PUB—2681) Present SLAC accelerator computer control system features. Davidson, V.; Johnson, R. (Stanford Linear Accelerator Center, CA (USA)). Feb 1981. Contract AC03-76SF00515. 3p. (CONF-810314—108). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The current functional organization and state of software development of the computer control system of the Stanford Linear Accelerator is described. Included is a discussion of the distribution of functions throughout the system, the local controller features, and currently implemented features of the touch panel portion of the system. The functional use of our triplex of PDP11-34 computers sharing common memory is described. Also included is a description of the use of pseudopanel tables as data tables for closed loop control functions.

19140 (SLAC-TN—80-2(Rev.)) SLAC/RAI LSI-11/2 Construction/configuration guide. Kieffer, J. (Stanford Linear Accelerator Center, CA (USA)). Mar 1981. Contract AC03-76SF00515. 70p. NTIS, PC A04/MF A01.

This document serves as a User Manual as well as a guide to building and testing an LSI-11/2 as packaged by RAI and supported by HEEP.

4304 Storage Rings

REFER ALSO TO CITATION(S) 19105, 19112, 19136

19141 (LBL—11753) Experiments on stochastic cooling of 200 MeV protons. Lambertson, G.R.; Bisognano, J.; Flood, W.; Kim, K.; Leeman, C.; Leskovar, B.; Lo, C.C.; Main, R.; Reimers, R.; Smith, L.; Staples, J. (Lawrence Berkeley Lab., CA (USA)). Mar 1981. Contract W-7405-ENG-48. 5p. (CONF-810314—124). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

Equipment for the stochastic cooling of 200 MeV protons in the Fermilab cooler ring has been installed and operated. Vertical and longitudinal cooling systems were installed by early 1980 and had successfully operated by May 1980. Traveling-wave structures particularly effective for the sub-relativistic beam velocities were used for the pickup and kicker electrodes.

44 INSTRUMENTATION

4401 Radiation Instrumentation

REFER ALSO TO CITATION(S) 19277, 19470, 19590

19142 (ANL-HEP-CP—80-19) History of the superconducting-magnet bubble chambers. Derrick, M.; Hyman, L.G.; Pewitt, E.G. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 30p. (CONF-8009142—1). NTIS, PC A03/MF A01.

From Symposium of the history of the ZGS; Argonne, IL, USA (13 Sep 1980).

This review covers the development of superconducting magnets, small bubble chambers, and the early history of the 12-foot bubble chamber. (MOW)

19143 (BNL—51115(Vol.2), pp 471-486) **Detector development for heavy-ions from 10 to 200 MeV/A.** Gruhn, C.R. (Univ. of California, Berkeley). Nov 1979. NTIS, PC A22/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

Heavy Ion (HI) physics has evolved with a class of detector problems and needs peculiar to this young and growing field of physics. Large solid angles and good accomodation for events with high multiplicities are a prerequisite in a large number of HI experiments. Usually it is desired to measure with high precision the momentum, charge, and mass of the particles. The high charge (Z) of the particles emphasizes such problems as space charge, recombination, plasma clearing times, and radiation effects. A HI detector program in gaseous ion chambers at LBL is the subject of talk today. The talk is in three sections. The first is concerned with HI energy loss fluctuations. The remaining two secions discuss two detector alternatives considered: Bragg Curve Spectroscopy and Precision Relativistic DE/DX Measurements.

19144 (BNL—51115(Vol.2), pp 487-500) **Experiences with large area position-sensitive heavy ion detectors.** Glaessel, P.; Harrach, D.V.; Maenner, R.; Specht, H.J. (Heidelberg Univ., Germany). Nov 1979. NTIS, PC A22/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

A parallel plate avalanche counter with position read-out from a grid of sense wires via a delay-line method has been developed. Units with areas of 26 x 26 cm^2 have been used successfully in a number of experiments. A time resolution of 240 ps FWHM and a x-y position resolution of 0.5 mm FWHM are obtained routinely.

19145 (DOE/EV/04326—3) In vivo measurements of bone-seeking radionuclides. Progress report, 1977-1980. Cohen, N. (New York Univ., NY (USA). Inst. of Environmental Medicine). 1980. Contract AC02-77EV04326. 167p. NTIS, PC A08/MF A01.

Separate abstracts were prepared for the 10 sections of this progress report dealing with the in vivo measurements of bone-seeking radionuclides. (KRM)

19146 (DOE/EV/04326—3, pp II.1-II.17) **Design and optimization characteristics of in vivo detection system.** 1980. NTIS, PC A08/MF A01.

In In vivo measurements of bone-seeking radionuclides. Progress report, 1977-1980.

A method has been developed, employing dual crystal scintillation detectors and real time computer analysis, to improve the detection limits for low energy photons (less than 150 keV) in the presence of other higher energy photon emitters in the body. Since, as this study indicates, the Compton scattering events from potassium-40 are responsible for a significant portion of the counts in the low energy background spectrum, it is possible to reduce background below 150 keV by simulataneously measuring the ^{40}K and calculating its contribution to the spectrum below 150 keV. (KRM)

19147 (DOE/EV/04326—3, pp IV.1-IV.21) **Computer assisted in vivo measurements of internally deposited radionuclides using dual-crystal scintillation detectors.** 1980. NTIS, PC A08/MF A01.

In In vivo measurements of bone-seeking radionuclides. Progress report, 1977-1980.

This paper discusses a channel specific modification of the low energy photon spectrum from an in vivo measurement of internally deposited radionuclides to remove the influence of naturally occurring K-40 in the body. A method has been developed to take advantage of the CsI(Tl) crystal in the dual-crystal detector and use it to directly measure K-40 while the then NaI(Tl) crystal measures only the low energy photons. Live-time, interactive computer analysis is used to determine the channel specific percentage contribution to the low energy spectrum. (KRM)

19148 (DOE/EV/04326—3, pp VII.1-VII.7) **Xenon-133,135 interference with in vivo low-energy measurements systems.** 1980. NTIS, PC A08/MF A01.

In In vivo measurements of bone-seeking radionuclides. Progress report, 1977-1980.

This section highlights the importance of gamma spectroscopists becoming aware of the possible existence of ^{133}Xe and ^{135}Xe in the air of their whole body counting facilities. The presence of ^{133}Xe and ^{135}Xe (released during normal reactor operation) can represent a significant interference to in vivo low-energy, photon-emitting assay procedures. (KRM)

19149 (DOE/EV/04326—3, pp VIII.1-VIII.13) **Estimation of background corrections to obtain net count rates for in vivo measurements of exposed subjects.** 1980. NTIS, PC A08/MF A01.

In In vivo measurements of bone-seeking radionuclides. Progress report, 1977-1980.

A subject specific (i.e., the subject acts as his own control) method has been developed whereby a subject can be rapidly screened for positive contamination based on linear extrapolation of the low-energy phoswich spectrum. The major limitation of the technique is that it is applicable only to situations where the possible contaminant is known and represents the only contaminant present. An interactive computer program has also been written to facilitate rapid data analysis. To use this method it is necessary to define the shape of the background spectrum for the energy region less than 160 keV. The characteristic spectral shape can be approximated by two straight lines which intersect at 80 keV. (KRM)

19150 (DOE/EV/04326—3, pp IX.1-IX.11) **Evaluation of detector positioning for low-energy in vivo gamma spectrometry.** 1980. NTIS, PC A08/MF A01.

In In vivo measurements of bone-seeking radionuclides. Progress report, 1977-1980.

To ensure precision in detector positioning relative to a subject, two dual crystal detectors are mounted on independent assem-

blies each with six degrees of rotational freedom. All of the possible degrees of movement are furnished with calibrated scale markings for reference purposes. To determine the relative detector positioning variability, a volunteer subject has been repetitively measured over the chest and around the head. In addition, an ^{241}Am lung phantom was measured over the chest in a similar manner. (KRM)

19151 (LA—8718) Humidity response of the Eberline model PAC-7 alpha instrument. McAtee, J.L. (Los Alamos Scientific Lab., NM (USA)). Apr 1981. Contract W-7405-ENG-36. 11p. NTIS, PC A02/MF A01.

Response of the Eberline Model PAC-7 alpha instrument under varying relative humidity (RH) and temperature conditions was studied in an environmental chamber. Electric discharges resulting in spurious counts or in instrument paralysis occurred at 35 to 50% RH. Improvement in the RH level tolerated by the PAC-7 alpha instrument was obtained by conformal coating of the high-voltage region of the printed circuit (PC) board. Following this treatment, electric discharges occurred only at relatively high humidity levels and then as a result of high-voltage breakdown within the AC-24C probe rather than within the PC board.

19152 (LA—8719) High-temperature and high-humidity response of the Eberline Model PRS-2 and the Eberline Model NRD neutron detector. McAtee, J.L. (Los Alamos National Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 5p. NTIS, PC A02/MF A01.

The high-humidity and high-temperature response of the Eberline Model PRS-2 portable scaler-ratemeter and the Eberline Model NRD neutron detector was studied in an environmental chamber. The BF_3 probe used in the NRD detector was found to produce count rate surges at temperatures $> 50^{\circ}C$ and at relative humidity $> 50\%$. The PRS-2 scaler-ratemeter was found to be relatively insensitive to high temperatures and high humidity.

19153 (LA-UR—81-171) New scintillators for fiber optics: system sensitivity and bandwidth as a function of fiber length. Lutz, S.; Franks, L.A.; Flournoy, J.M.; Lyons, P.B. (EG and G, Inc., Goleta, CA (USA); Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 5p. (CONF-810613—2). NTIS, PC A02/MF A01.

From Conference on lasers and electro-optics; Washington, DC, USA (10 Jun 1981).

Long-wavelength liquid scintillators have been developed for fiber-optic plasma-diagnostic experiments. Relative system sensitivity and bandwidth data as a function of fiber length for several scintillator systems will be presented.

19154 (LA-UR—81-861) Gas scintillation proportional counters. Anderson, D.F. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract CONF-810351—1. 22p. NTIS, PC A02/MF A01.

The principle of operation of the gas scintillation proportional counter and a history of its developmnt is presented here. Its advantages and possible applications are also considered.

19155 Method of improving BEO as a thermoluminescent detector. Christian, D.J.; Gammage, R.B.; Thorngate, J.H. (to Department of Energy). US Patent 4,224,519. 23 Sep 1980. Filed date 26 Jun 1979. vp.

PAT-APPL-52179.

Measurements of radiation exposure below 1 mr are possible with a beo ceramic thermoluminescent detector (Tld) by treating the tl signal in a manner that discriminates against an interferring pyroelectric incandescence (Pi). This is accomplished by differentiating the signals electronically to cause the composite signal to cross the baseline. A zero-crossing detector then senses and clips the negative-going portion of the signal. The resultant signal is integrated, producing a result wherein the true tl signal is substantially greater than the pi signal.

19156 Multi-angle nuclear imaging apparatus and method. Anger, H.O. (to Dept. of Energy). US Patent 4,197,469. 8 Apr 1980. Filed date 11 Feb 1977. 12p.

Nuclear imaging apparatus for obtaining multi-plane readouts of radioactive material in a human or animal subject is proposed. A probe disposed in the vicinity of the subject is provided for receiving radiation from radiating sources in the subject and for forming a probe radiation image. The probe has a collimator with different portions thereof having holes disposed at different angles. A single scintillation crystal overlies the collimator for receiving radiation passing through the collimator and producing scintillations to provide the probe image. An array of photomultiplier tubes overlie the single crystal for observing the probe imaging and providing electrical outputs. Conversion apparatus is provided for converting the electrical outputs representing the probe imaging into optical images displayed on the screen of a cathode ray tube. Apparatus is provided whereby there is produced on the light sensitive medium a plurality of images that portray the subject as seen from different angles corresponding to the portions of the collimator having holes at different angles.

4402 Radiation Effects On Instrument Components, Instruments, Or Electronic Systems

REFER ALSO TO CITATION(S) 19092

4403 Miscellaneous Instruments

REFER ALSO TO CITATION(S) 17920, 17938, 19194

19157 (MLM—2813) Test and evaluation of an Argonne National Laboratory small sample calorimeter. Rodenburg, W.W. (Mound Facility, Miamisburg, OH (USA)). 30 Apr 1981. Contract AC04-76DP00053. 18p. (ISPO—136). NTIS, PC A02/MF A01.

This report provides details of an evaluation made at Mound Facility of the performance of the modified Argonne National Laboratory (ANL) small sample calorimeter (SSC). The goals of this evaluation were to: (1) Determine whether the problems associated with the previous calorimeter were solved. (2) Provide assurance that the procedures and operating characteristics remain valid for the modified instrument. (3) Calibrate the instrument using plutonium-fueled heat standards. (4) Provide recommendations for the operation of this instrument.

19158 (SAND—80-0755) Dual-beam, second-derivative tunable diode-laser infrared spectroscopy applied to trace gas measurement. Tallant, D.R.; Jungst, R.G. (Sandia National Labs., Livermore, CA (USA)). Apr 1981. Contract AC04-76DP00789. 23p. NTIS, PC A02/MF A01.

A dual beam diode laser spectrometer has been constructed using off-axis reflective optics. The spectrometer can be amplitude modulated for direct absorption measurements or frequency modulated to obtain derivative spectra. The spectrometer has high throughput, is easy to operate and align, provides good dual beam compensation, and has no evidence of the interference effects that have been observed in diode laser spectrometers using refractive optics. Unpurged, using second derivative techniques, the instrument has measured 108 parts-per-million CO (10 cm absorption cell, atmospheric pressure-broadened) with good signal/noise. With the replacement of marginal instrumental components, the signal/noise should be substantially increased. This instrument was developed to monitor the evolution of decomposition gases in sealed containers of small volume at atmospheric pressure.

19159 (Y—2225) Liquid-phase detection instrument to record and annunciate procedural deviations in sintering runs. Mee, D.K.; Darby, D.M.; Sims, T.M. Jr. (Oak Ridge Y-12 Plant, TN (USA)). 15 Apr 1981. Contract W-7405-ENG-26. 22p. NTIS, PC A02/MF A01.

A liquid-phase detection instrument (LPDI) has been developed to aid in making consistently accurate alloy sintering runs. The LPDI displays the furnace temperature, detects the alloy's liquid-phase arrest temperature, calculates the necessary hold temperature from the arrest temperature (i.e., calibrates the system), and provides a digital record for quality assurance purposes. In field tests, the instrument's detected arrest temperature was within $+1^{\circ}$ to $-0^{\circ}C$ of an operator's assessment of the actual arrest temperature.

4404 Well Logging Instrumentation

19160 (GJBX—75(81)) DOE/Simplec magnetic susceptibility logging system. Emilia, D.A.; Allen, J.W.; Chessmore, R.B.; Wilson, R.B. (Bendix Field Engineering Corp., Grand Junction, CO (USA); Simplec Manufacturing Co., Inc., Dallas, TX (USA)). Mar 1981. Contract AC13-76GJ01664. 40p. NTIS, PC A03/MF A01.

A magnetic susceptibility logging system has been developed which is relatively stable under normal field logging conditions and which produces logs that accurately represent in situ variations in magnetic susceptibility. However, both field and laboratory tests indicate the need for further improvement of temperature stabilization and bridge compensation; a new generation system designed by Simplec may fill that need. A cubic granite block with a magnetic susceptibility of 385 μCGS is designated as the primary calibration standard and is available for public use at the DOE facility in Grand Junction, Colorado. Models are also available for characterization of magnetic susceptibility systems. These include models to provide borehole size correction factors, thin layer interpretation parameters, reproducibility limits, longitudinal resolution, and radius of investigation. The DOE/Simplec system has a 99-percent radius of investigation, approximately equal to the coil length (15 inches), and a 99-percent thickness of investigation, approximately equal to two coil lengths. The true magnetic susceptibility and thickness of isolated layers less than two coil lengths in thickness can be obtained through use of parameters measured from their log responses. Field tests show that the system has a reproducibility of at least 5 μCGS and that logging at 25 ft/min is a good compromise between speed of operation and keeping the probe on the sidewall. Comparison of log and core magnetic susceptibility measurements confirms the fact that the logging system samples a rather large volume and that interpretive aids are necessary to unfold the true variation of magnetic susceptibility with depth. Finally, logs from known uranium-favorable environments show that magnetic susceptibility measurements can give an indication of the degree of geochemical alteration, which is one of the uranium-favorable haloes sought by exploration geologists.

19161 (UCRL—85102) Calibration of a neutron log in partially saturated media. Part II. Error analysis. Hearst, J.R.; Kasameyer, P.W.; Dreiling, L.A. (Lawrence Livermore National Lab., CA (USA)). 20 Mar 1981. Contract W-7405-ENG-48. 47p. (CONF-810616—2). NTIS, PC A03/MF A01.

From Society of Professional Well Log Analysts meeting; Mexico City, Mexico (23 Jun 1981).

Four sources or error (uncertainty) are studied in water content obtained from neutron logs calibrated in partially saturated media for holes up to 3 m. For this calibration a special facility was built and an algorithm for a commercial epithermal neutron log was developed that obtains water content from count rate, bulk density, and gap between the neutron sonde and the borehole wall. The algorithm contained errors due to the calibration and lack of fit, while the field measurements included uncertainties in the count rate (caused by statistics and a short time constant), gap, and density. There can be inhomogeneity in the material surrounding the borehole. Under normal field conditions the hole-size-corrected water content obtained from such neutron logs can have an uncertainty as large as 15% of its value.

45 EXPLOSIONS AND EXPLOSIVES

4501 Chemical

19162 (LA—5479(Rev.)) Test problems for hydrocodes. Fickett, W.; Rivard, W.C. (Los Alamos Scientific Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 34p. NTIS, PC A03/MF A01.

A collection of exact solutions to the inviscid (Euler) equations of motion is presented for use in testing finite-difference calculations. The emphasis is on problems involving solid explosives and inerts.

19163 (LA—8696) Deflagration-to-detonation transition in small-diameter columns of PETN. Dinegar, R.H. (Los Alamos Scientific Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 6p. NTIS, PC A02/MF A01.

The transition from deflagration to detonation in pure pentaerythritol tetranitrate (PETN) confined in small-diameter (2-mm) steel columns of three lengths (6.4, 9.6, and 12.8 mm) was examined. These relatively low density pressings of PETN were deflagrated by donor charges of high-density PETN that had been ignited by a hot wire. A dent produced in an aluminum witness block was the criterion for determining detonation. The transition from burning to detonation occurred in pressings of all three lengths. Detonation velocities sufficient to initiate high-density PETN booster pellets were reached in the 9.6- and 12.8-mm pressings.

19164 (LA-UR—81-704) Fine structure in nitromethane/acetone detonations. Davis, W.C. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 7p. (CONF-810602—8). NTIS, PC A02/MF A01.

From 7. symposium on detonation; Annapolis, MD, USA (19 Jun 1981).

Dark waves in the detonation front of nitromethane/acetone mixtures, known for 30 years, have been photographed using pairs of image intensifier cameras, triggered at slightly different times. The photographs show the motions and changes of the complex wave structure. Intriguing results are that the average brightness doesn't change as much from center to edge as simple theory would predict, and brightness goes down rather than up when a reflected shock from a glass plate enters the explosive products. The structure remains visible in the products stagnated against a glass plate, showing that the bright regions are high temperature regions, not just areas where less absorbing material is present ahead of the emitting layer.

19165 (LA-UR—81-705) Initiation transient in dilute explosives. Fickett, W. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 10p. (CONF-810602—7). NTIS, PC A02/MF A01.

From 7. symposium on detonation; Annapolis, MD, USA (19 Jun 1981).

In the context of the shock-initiation problem, we study analytically the first effects of chemistry, treating a small chemical heat release as a perturbation on an inert flow. Specifically, we study the initial transient in plane-shock initiation in a dilute explosive, where the chemical energy is small relative to the mechanical-thermal energy. The vehicle for the study is the mathematical analog for reactive flow. The solution resembles a double refraction: to first order, the pressure or density is a superposition of two forward-going waves, both originating at the rear boundary, and carrying the same function, but running at different velocities. Surprisingly, this first-order solution is independent of the sensitivity of the reaction rate to the state, which appears only at second order.

19166 (LA-UR—81-706) Nonideal detonation and initiation behavior of a composite solid rocket propellant. Dick, J.J. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 5p. (CONF-810602—10). NTIS, PC A02/MF A01.

From 7. symposium on detonation; Annapolis, MD, USA (19 Jun 1981).

Shock initiation and detonation behavior of an HMX/AP/Al rocket propellant were studied for nonideal character. Low detonation velocities and unusual shock initiation behavior were observed. Failure to propagate steady detonation in cylinders of the propellant was also noted.

19167 (LA-UR—81-871) Shock initiation of porous TATB. Anderson, A.B.; Ginsberg, M.J.; Seitz, W.L.; Wackerle, J. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 10p. (CONF-810602—20). NTIS, PC A02/MF A01.

From 7. symposium on detonation; Annapolis, MD, USA (19 Jun 1981).

The planar shock initiation of 1.8-g/cm^3 TATB has been studied with embedded-Manganin pressure gauges and with the explosive wedge technique. A Lagrangian analysis and an assumed

equation of state were used to determine reaction histories during the initiation process. Correlation of reaction rates to state variables has resulted in a shock-strength modified Arrhenius rate law. Numerical simulations employing the rate law have been performed for a number of initiation experiments on TATB.

19168 (LA-UR—81-872) Customized explosives based on plastic-bonded mixtures of TATB and HMX. Campbell, A.W.; Flaugh, H.L.; Popolato, A.; Ramsay, J.B. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 9p. (CONF-810602—19). NTIS, PC A02/MF A01.

From 7. symposium on detonation; Annapolis, MD, USA (19 Jun 1981).

Experimental data are presented for a series of TATB-HMX mixtures with Kel-F 800 binder. Both detonation properties and safety properties were evaluated. The addition of HMX to TATB makes possible a wide range in such properties as specific energy, detonation velocity and divergence, failure diameter and handling safety. This flexibility is not without penalty however. The sensitivity of TATB-HMX mixtures increased rapidly with increasing HMX content, even at relatively low levels of HMX and some trade-off must be made between detonation properties and safety.

19169 (LA-UR—81-917) Eutectic composite explosives containing ammonium nitrate. Stinecipher, M.M. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 11p. (CONF-810602—11). NTIS, PC A02/MF A01.

From 7. symposium on detonation; Annapolis, MD, USA (19 Jun 1981).

The eutectic of ammonium nitrate (AN), the ammonium salt of 3,5-dinitro-1,2,4-triazole was prepared and its sensitivity and performance were studied. It was found that this AN formulation was unusual in that it performed ideally at small diameter, which indicated that it was a monomolecular explosive. Sensitivity tests included type 12 impact, Henkin thermal and wedge tests, and performance tests included rate stick/plate dent, cylinder, and aquarium tests. Results were compared with calculations, standard explosives, and another eutectic, ethylendiamine dinitrate (EDD)/AN.

19170 (LASL—81-9) Thermal hazards of explosives. Rogers, R.N. (Los Alamos National Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 4p. NTIS, PC A02/MF A01.

Small-scale methods for determining the reaction rates of explosives that make it possible to predict safe temperatures for using them, and methods for testing the accuracy of these predictions were developed. Each different size and shape of each different explosive has its own critical temperature. The ability to predict these critical temperatures is required before high-energy materials can be used safely.

19171 (MHSMP—81-17) Preliminary evaluation of HMX explosives with Kraton G binder. Stallings, T.L.; Osborn, A.G.; Johnson, H.D.; Crutchmer, J.A. (Mason and Hanger-Silas Mason Co., Inc., Amarillo, TX (USA)). Apr 1981. Contract AC04-76DP00487. 12p. NTIS, PC A02/MF A01.

A preliminary evaluation of physical properties and sensitivity characteristics was made for two HMX plastic bonded explosives containing Kraton G 1650 binder. Both explosives were less sensitive in the skid test than LX-14 and LX-10 and close to the same sensitivity as PBX 9501. Physical properties were measured before and after accelerated aging. Both showed an increase in stress and a decrease in strain after aging.

19172 (MHSMP—81-22) Diametric disc and standard tensile-test correlation study. Process development endeavor No. 209. Johnson, H.D. (Mason and Hanger-Silas Mason Co., Inc., Amarillo, TX (USA)). Apr 1981. Contract AC04-76DP00487. 12p. NTIS, PC A02/MF A01.

The tensile and diametric disc ultimate stress-strain group means of fifteen lots of RX-03-BB material were used to determine the correlation between the standard tensile test and diametric disc test. Statistical results show that the tensile/disc ultimate stress linear correlation coefficient was high (0.879) and the linear correlation coefficient for strain somewhat lower (0.568). Density variations as low as 0.020 Mg/m^3 significantly affected the diametric disc ultimate stress. The ultimate strain was not significantly affected within the limited density range (0.055 Mg/m^3) of this experiment.

19173 (UCRL—52997) LLNL explosives handbook: properties of chemical explosives and explosives and explosive simulants. Dobratz, B.M. (Lawrence Livermore National Lab., CA (USA)). 16 Mar 1981. Contract W-7405-ENG-48. 528p. NTIS, PC A23/MF A01.

This handbook presents information and data for high explosives (HEs) of interest to programs at the Lawrence Livermore National Laboratory (LLNL) and other Department of Energy (DOE) facilities. It is intended to be useful to the scientist or engineer, the novice or expert, who needs to develop a new weapon system, design a physics experiment, or select and/or evaluate an existing explosive. This compilation is limited to production HEs and their components. High explosives are divided into two classes: initial detonating (or primary) and noninitiating (or secondary) explosives. The primary HEs, such as azides and fulminates, are extremely sensitive to ignition by heat, shock, and electrical discharge; ignition leads to high-order detonation of the material - even for milligram quantities. The use of these HEs is therefore limited to squibs and starting materials for low-energy detonators. Because primary explosives have little application at LLNL, this compilation includes only the properties of lead azide and lead styphnate. Secondary HEs as a class comprise single compounds of mixtures; the mixtures contain one or more explosive compounds and one or more of the following ingredients: metals, binders, plasticizers, sensitizers or desensitizers, oxidizers, and a coloring agent. Because many of the secondary high explosives are mixtures, the properties of the additives and binders used are included. The data are the most up-to-date and accurate available to the knowledge of the compiler. The sources of information include textbooks, journal articles, technical reports, memoranda, letters, and personal communications. The reader is urged to consult the source document to properly evaluate and interpret the data given in this compilation. The compilation consists of sections on high explosives and mock explosives, formulation nomenclature (codes), data sheets on individual materials, and a bibliography.

19174 (UCRL—84985) Detonation chemistry: an investigation of fluorine as an oxidizing moiety in explosives. McGuire, R.R.; Ornellas, D.L.; Helm, F.H.; Coon, C.L.; Finger, M. (Lawrence Livermore National Lab., CA (USA)). 22 Apr 1981. Contract W-7405-ENG-48. 12p. (CONF-810602—23). NTIS, PC A02/MF A01.

From 7. symposium on detonation; Annapolis, MD, USA (19 Jun 1981).

We have investigated the use of fluorine in the form of difluoramino (NF_2) group as an oxidizing moiety. Bis- and tris-difluoramino perfluorobutane, previously unknown, were especially synthesized for this study. We performed detonation calorimetry studies to determine the exact detonation product compositions and the heats of detonation of a series of NF_2 compounds and mixtures. We then performed cylinder tests to determine their detonation performance. Similar tests on NO_2 compounds were used for comparison. For reasons of toxicity and safety, we designed and built remote mixing and loading apparati for certain of the materials. Materials were chosen to highlight certain of the detonation products. Hydrogen fluoride was found to be a favorable detonation product compared with H_2O, CO_2 outperforms CF_4 at all cylinder expansion ratios, and Al_2O_3 was a favorable detonation product compared to AlF_3. The most important result is the better understanding of the mechanism of reaction of small-particle aluminum in a detonation.

19175 (UCRL—84986) Chemical-decomposition models for the thermal explosion of confined HMX, TATB, RDX, and TNT explosives. McGuire, R.R.; Tarver, C.M. (Lawrence Livermore National Lab., CA (USA)). 26 Mar 1981. Contract W-7405-ENG-48. 9p. (CONF-810602—15). NTIS, PC A02/MF A01.

From 7. symposium on detonation; Annapolis, MD, USA (19 Jun 1981).

Chemical decomposition models have been deduced from the available chemical kinetic data on the thermal decomposition of HMX, TATB, RDX, and TNT. A thermal conduction model is used in which the thermal conductivity of the reacting explosive decreases linearly with the mass fraction reacted to that of the gaseous products. These reactive heat flow models are used to predict the time to explosion versus reciprocal temperature curves from several heavily confined explosive tests. Good agreement is obtained between experimental and calculated explosion times for the pure explosives HMX, TATB, RDX, and TNT, mixtures such as RX-26-AF (HMX/TATB), Octol (HMX/TNT), and Comp B (RDX/TNT), and for PBX 9404, an HMX-based explosive containing an energetic nitrocellulose binder.

19176 **(UCRL—84987) Interpolation of detonation parameters from experimental particle-velocity records.** Hayes, B.; Tarver, C.M. (Lawrence Livermore National Lab., CA (USA)). 1981. Contract W-7405-ENG-48. 10p. (CONF-810602—24). NTIS, PC A02/MF A01.

From 7. symposium on detonation; Annapolis, MD, USA (19 Jun 1981).

Measurements from a high resolution particle velocity gauge system are used to investigate reaction zone profiles in several detonating heterogeneous explosives. The analysis of the measured particle motion provides a detailed characterization of the detonation wave front. A major finding is that not all secondary explosives exhibit particle velocity, pressure and volume profiles consistent with the Zeldovich-von Neumann-Doring (ZND) model of a detonation front. For example, the experimental rise time of the pressure profile in triaminotrinitrobenzine (TATB) is approximately 70 nanoseconds measured with equipment displaying 10 nanosecond resolution for shock waves in inert materials. Hydrodynamic computer code modeling of the experimental records using the ignition and growth reactive flow concept has been used to verify the time response of the particle velocity probe and to interpret the results. Detonation parameter profiles in TATB can be simulated by modifying the ZND-type ignition and growth model to include either a viscous dissipation process coupled with exothermic reaction, or a two-step chemical reaction sequence in which an endothermic reaction precedes the exothermic reaction that sustains steady detonation wave propagation.

19177 **(UCRL—84989) Temperature measurement of shocked explosives by time-resolved infrared radiometry: a new technique to measure shock-induced reaction.** Von Holle, W.G.; Tarver, C.M. (Lawrence Livermore National Lab., CA (USA)). 1981. Contract W-7405-ENG-48. 13p. (CONF-810602—16). NTIS, PC A02/MF A01.

From 7. symposium on detonation; Annapolis, MD, USA (19 Jun 1981).

Time-resolved two-band infrared radiometry has been used to measure the infrared emission from shocked PBX 9404 and an HMX-based propellant with impedance-matching infrared transmitting overlays. The results allow the estimation of rates of reaction, which agree with computed simulations of the experiments. In PBX 9404, the initial rate of reaction is dependent on input shock amplitude to a high degree, while exhibiting a much weaker dependence of the rate on the pressure build up in the explosive. These results are compared with those for an HMX-based propellant. Time-resolved emission from shocked nitromethane was measured in the same arrangement. Large differences between the two resolved bands in shocked nitromethane are interpreted as partial reaction taking place before detonation.

19178 **(UCRL—84998) Shock initiation of explosives by the impact of small diameter cylindrical projectiles.** Green, L.G. (Lawrence Livermore National Lab., CA (USA)). 1981. Contract W-7405-ENG-48. 6p. (CONF-810602—18). NTIS, PC A02/MF A01.

From 7. symposium on detonation; Annapolis, MD, USA (19 Jun 1981).

A simple method for the calculation of detonation threshold velocity for a small diameter cylindrical projectile impacting on bare or metal clad explosive has been developed. Agreement between calculation and experiment for PBX 9404 and Comp B-3 is very good.

19179 **(UCRL—84999) Delayed detonation in propellants from low-velocity impact.** Green, L.G.; James, E.; Lee, E.L.; Chambers, E.S.; Tarver, C.M.; Westmoreland, C.; Weston, A.M.; Brown, B. (Lawrence Livermore National Lab., CA (USA); Brobeck (William M.) and Associates, Berkeley, CA (USA); Hercules, Inc., Magna, UT (USA). Bacchus Works). 1981. Contract W-7405-ENG-48. 11p. (CONF-810602—5). NTIS, PC A02/MF A01.

From 7. symposium on detonation; Annapolis, MD, USA (19 Jun 1981).

Certain high HMX-content propellants are found to undergo delayed detonation when cylinders of the propellant are subjected to axisymetric impact. The magnitude of the impact pressure is considerably less than that required for prompt shock initiation. It is also found that granular propellant (65 to 78% theoretical maximum density) packed in a thick-walled (50 mm) Plexiglas pipe is easily detonated by relatively low-velocity (130 m/s) piston compaction of the porous propellant. The above processes appear to be related to each other and to the more classical deflagration-to-detonation studies carried out in heavy-walled pipes where the explosive is deliberately ignited to start the build-up to detonation.

19180 **(UCRL—85000) Correlation of the results of shock-initiation tests.** Weston, A.M.; Kincaid, J.F.; James, E.; Lee, E.L.; Green, L.G.; Walton, J.R. (Brobeck (William M.) and Associates, Berkeley, CA (USA); Johns Hopkins Univ., Laurel, MD (USA). Applied Physics Lab.; Lawrence Livermore National Lab., CA (USA)). 1981. Contract W-7405-ENG-48. 12p. (CONF-810602—14). NTIS, PC A02/MF A01.

From 7. symposium on detonation; Annapolis, MD, USA (19 Jun 1981).

Results from a variety of shock initiation and detonation propagation tests including the results from a large scale propellant initiation study have been correlated, applying a critical energy fluence criterion to pressure histories. Organization of the results shows systematic differences between pressed explosives and cast propellants. Further, the composite materials used in the large-scale propellant study must be considered as belonging to another class that differs from ideal explosives. Hydrodynamic calculations are employed to establish the precise nature of the correlation. It is shown how simple approximations can be used to evaluate shock initiation thresholds.

19181 **Production of the ammonium salt of 3,5-dinitro-1,2,4-triazole by solvent extraction.** Lee, K.Y.; Ott, D.G. (to Department of Energy). US Patent 4,236,014. 25 Nov 1980. Filed date 7 Nov 1979. vp.

PAT-APPL-092155.

The ammonium salt of 3,5-dinitro-1,2,4-triazole has utility as a chemical explosive. In accordance with the present invention, it may readily be produced by solvent extraction using high molecular weight, water-insoluble amines followed by amination with anhydrous ammonia gas. The aqueous reaction mixture produced in the synthesis of the parent compound, 3,5-dinitro-1,2,4triazole, is quite suitable--and indeed is preferred--for use as the feed material in the process of the invention.

4502 Nuclear

REFER ALSO TO CITATION(S) 18423, 19405

19182 **(LA-UR—81-1016) Unusual capabilities and new programs.** Janney, D.H. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 13p. (CONF-810354—1). NTIS, PC A02/MF A01.

From Weapons agencies nondestructive test organization meeting; Golden, CO, USA (10 Mar 1981).

A multipurpose NDE laboratory develops many techniques for special purposes. Without an intentional effort to relate these techniques to problems of the nuclear weapons community we pass by opportunities for valuable interchanges. Several solutions to weapons problems are described. Out of these descriptions better NDE techniques will emerge for use in examination of weapons and weapon components.

19183 **(SAND—80-1138) In-situ stress from hydraulic fracture measurements in G Tunnel, Nevada Test Site.** Smith, C.; Vollendorf, W.C.; Warren, W.E. (Sandia National Labs., Albuquerque, NM (USA)). Apr 1981. Contract AC04-76DP00789. 70p. NTIS, PC A04/MF A01.

Hydraulic fracture work in G Tunnel, Nevada Test Site, performed to obtain the in-situ stress state is discussed. Field equipment and procedures are described; analysis is developed to relate the hydraulic fracture pressures to the in-situ stress state. Pressure data are analyzed to provide estimates of the stress state at a number of locations in the tunnel complex. A unique feature of the work is the mineback - a mining process in which the rock is cut away to reveal the actual plane of the fracture. Advantages, limitations, and problem areas associated with extracting in-situ stress fields from hydraulic fracture pressure records are discussed in detail.

4503 Explosion Detection

REFER ALSO TO CITATION(S) 19393

50 ENVIRONMENTAL SCIENCES, ATMOSPHERIC

5001 Basic Studies

19184 **(ANL—79-65(Pt.4)) Radiological and Environmental Research Division. Annual report, January-December 1979.** Rowland, R.E.; Hicks, B.B. (Argonne National Lab., IL (USA)). 1979. Contract W-31-109-ENG-38. 95p. NTIS, PC A05/MF A01.

A comparison of this document with previous reports of this series will reveal some substantial changes in the research performed by this Section. There have been several projects in which scientific work has evolved, creating the bases for exciting new programs. For example, the Section's work on micrometeorology is now closely identified with work on the dry deposition of airborne particles and trace gases. Under EPA sponsorship, we are develping methods for parameterizing the dry deposition of acid aerosol for the MAP3S program. In a second EPA program, we are conducting field experiments to investigate the physical, chemical and biological factors that control dry deposition rates to natural surfaces. Under DOE sponsorship, we are conducting field experiments concentrating on the deposition of trace gases and particles to open water surfaces. The Section's Advanced Statistical Trajectory Regional Air Pollution (ASTRAP) model is an upgraded version of the STRAP model developed in the MAP3S program while MAP3S was supported by DOE. While ASTRAP is being modified for investigation of regional nitrate pollution and deposition, separate modeling activities are addressing problems of pollutant behavior in clouds and in topographically complicated regions. DOE is sponsoring independent programs under its Atmospheric Studies of Complex Terrain (ASCOT) program and its multilaboratory diesel emission research program.

19185 (LMF—84, pp 305-308) **Evaluation of various types of wire screens as diffusion battery cells.** Yeh, H.C.; Cheng, Y.S.; Orman, M.M. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Monodisperse particles, 0.01 to 0.22 μm in diameter, were used to measure particle collection efficiencies for the screen-type diffusion battery. Four types of stainless steel wire screens were used as the diffusion cell material. Collection efficiency (or penetration) data were compared with the screen-type diffusion battery theory previously developed. Good agreement between theoretical predictions and experimental data, for all four types of screens, was obtained.

19186 (LMF—84, pp 309-312) **Collection efficiencies of a point-to-plane electrostatic precipitator.** Cheng, Y.S.; Yeh, H.C.; Kanapilly, G.M. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Collection efficiencies of a point-to-plane electrostatic precipitator were evaluated as functions of particle size, aerosol flow and ion current. Monodisperse aerosols ranging from 0.03 to 2.0 μm effective mean diameter were used. Collection efficiencies decrease with (1) an increase of aerosol flow rate, (2) a decrease of particle size and (3) an increase of ion current. At the lowest tested flow rate, 100 cm^3/min, the effects of ion current and particle size seem to be minimal, and average efficiencies of 85% over the entire particle size range used in this study was determined.

19187 (LMF—84, pp 313-316) **Effects of aerosol particle properties on fluidized bed aerosol generator operation.** Carpenter, R.L.; Yerkes, K.L. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

A fluid bed aerosol generator (FBG) has been used to examine dispersion characteristics of FBG's. Changing fine particle concentrations in the bed and aerosol particle shape affects generator operation. Fine powder addition changes bed flow characteristics of the bed until 4% (by volume) is composed of fine particles. The fluid bed could completely disperse spherical fly ash particles at 1.5% fine particle addition. Shapes of aerosolized particles also affects operating characteristics of the fluid bed. Particle shape affects aerosol output and aerosol size as a function of time as well as aerosol output as a function of flow through the fluid bed.

19188 (LMF—84, pp 384-386) **Results of high temperature/high pressure sampling from a low Btu coal gasifier.** Carpenter, R.L.; Newton, G.J.; Cheng, Y.S.; Barr, E.B.; Yeh, H.C. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

A high temperature-high pressure (HTHP), sevenstage cascade impactor has been designed, built, calibrated and used to obtain size classified samples of entrained fly ash from process streams of a pressurized low Btu coal gasifier. Process stream conditions were 400 to 700°C and 1 to 15 atmospheres. The cascade impactor was designed for effective cutoff diameter range of 12 μm down to about 0.5 μm aerodynamic diameter. Results of six HTHP cascade impactor samples indicated a mass median aerodynamic diameter at stream conditions of 2.80 +- 0.81 μm with a geometric standard deviation of 2.46 +- 0.41.

19189 (LMF—84, pp 387-391) **Aerosols from low-Btu gas combustion.** Cheng, Y.S.; Yeh, H.C.; Carpenter, R.L.; Newton, G.J.; DeNee, P.B. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

A combustion study of low Btu gas from an experimental stirred-bed Lurgi coal gasifier is reported. The combustion chamber was equipped with sampling systems capable of simultaneously collecting both particulate and organic vapor-phase emissions from combustion effluents. Electron micrographs showed that combustion particles were singlets and spherical in shape. Particle size distributions measured by an electrical aerosol analyzer showed three modes between 0.0032 and 1.0 μm in diameter. The two larger size modes were confirmed by measurements from both a point-to-plane electrostatic precipitator and a quartz crystal microbalance cascade impactor. Mass loading and size distribution of combustion aerosols for premixed and diffusion flames did not differ significantly. Mass loading of particulate emissions was between 0.00014 and 0.0002 lb/10^6 Btu, an order of magnitude lower than those from combusting natural gas.

19190 (LMF—84, pp 392-394) **Chemical characterization of organics in vapor phase and particulate samples of low Btu gasifier effluents.** Hanson, R.L.; Carpenter, R.L.; Horinek, D.D. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The experimental low Btu gasifier at the Morgantown Energy Technology Center was equipped with a gas cleanup system that effectively removed high molecular weight organics

from the gas. Several polynuclear aromatic hydrocarbons with molecular weights between 100 to 370 amu were found in the raw gas while the cleaned gas had fewer compounds with a molecular weight range from 100 to 202 amu. The cleaned gas burned with the production of very low concentrations of organic compounds.

19191 (LMF—84, pp 395-397) **Isolation and identification of aza-arenes from the process stream material of an experimental low Btu gasifier.** Benson, J.M.; Farr, K. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Attempts have been made to isolate and identify aza-arene and polynuclear aromatic amine components of low Btu gasifier process stream material. Phenoxazine ($C_{12}H_9NO$) has been tentatively identified by gas chromatography-mass spectrometry as a component of the basic fraction of this material. In addition, the diaza-arenes, diazapyrene or diazafluoranthene ($C_{14}H_7N_2$) and their methylated derivatives ($C_{15}H_9N_2$) have also been tentatively identified. To date, no polycyclic aromatic amines have been identified.

19192 (LMF—84, pp 398-401) **High performance liquid chromatographic procedure for analysis of low Btu gasifier process stream material.** Hanson, R.L.; Benson, J.M.; Horinek, D.D. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The determination of the approximate molecular weight ranges of polynuclear aromatic hydrocarbons in an impinger sample of an experimental low Btu gasifier process stream was made by comparison of high performance liquid chromatograms of these samples to the high pressure liquid chromatograms of a broad molecular weight range (154 to 472 amu) of polynuclear aromatic hydrocarbon standards. Column chromatography was used to fractionate the sample. Chemical characterization of the fractions was performed using infrared spectroscopy, gas chromatography and gas chromatography/mass spectrometry.

19193 (LMF—84, pp 402-405) **Analysis of gasifier samples for organometallic compounds.** Weissman, S.H.; Dahl, A.R.; Blasi, J. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Coal gasification process streams contain high levels of CO gas, incompletely combusted organic material and metal ions at elevated pressures and temperatures. Such conditions may lead to the production of organometallic compounds, substances that could represent an inhalation hazard. Initial analysis of waste effluents from an experimental low Btu gasifier indicated that lipophilic forms of some metallic elements can be detected in the waste tar collected during cleanup of the process stream gas. Further work is needed to determine the amount and the type of these compounds associated with the coal gasification process.

19194 (LMF—84, pp 409-415) **Comparative instrument study on the size characteristics of yttrium oxide aggregate aerosols.** Kanapilly, G.M.; Cheng, Y.S.; Gray, R.H.; Yeh, H.C. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

This report presents the results of a comparative instrumental size characterization study on small irregularly shaped Y_2O_3 aggregate aerosols. The instruments used were (1) an electrical aerosol analyzer, (2) a wire mesh diffusion battery, (3) a Stoeber aerosol centrifuge and (4) a high resolution transmission electron microscope. The relative reliabilities of the instruments are discussed. Stereo electron micrographs revealed that these aggregate aerosols were complex three-dimensional structures. The dynamic shape factor of these aerosols was about 2.

19195 (LMF—84, pp 416-419) **Stereographic analysis of aggregate aerosols.** Gray, R.H.; Kanapilly, G.M.; DeNee, P.B.; Cheng, Y.S.; Wolff, R.K. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Irregularly shaped aggregate aerosols from several sources were studied by stereographic technique. A three-dimensional image from two electron micrographs of the same area taken at a slight angular separation was used for stereoscopic-visualization. Stereography has contributed to the characterization of aggregate aerosols by providing more reliable determination of (a) the number of primary particles present in an aggregate, (b) the primary particle sizes, (c) the complex shape of the aggregate particle and (d) height or length of the branches.

5002 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 17934, 17937, 17977, 18544, 18802, 19103, 19184, 19213, 19224, 19321, 19324, 19325, 19326, 19327, 19328, 19334, 19335, 19336, 19337, 19338, 19339, 19351, 19358, 19360, 19361, 19362

19196 **(CONF-810319—2) High efficiency particulate removal with sintered metal filters.** Kirstein, B.E.; Paplawsky, W.J.; Pence, D.T.; Hedahl, T.G. (Science Applications, Inc., San Diego, CA (USA); EG and G Idaho, Inc., Idaho Falls (USA)). 1981. Contract AC07-76ID01570. 9p. NTIS, PC A02/MF A01.

From 3. symposium on the transfer and utilization of particulate control technology; Orlando, FL, USA (9 Mar 1981).

Because of their particle removal efficiencies and durability, sintered metal filters have been chosen for high efficiency particulate air (HEPA) filter protection in the off-gas treatment system for the proposed Idaho National Engineering Laboratory Transuranic Waste Treatment Facility. Process evaluation of sintered metal filters indicated a lack of sufficient process design data to ensure trouble-free operation. Subsequence pilot scale testing was performed with flyash as the test particulate. The test results showed that the sintered metal filters can have an efficiency greater than 0.9999999 for the specific test conditions used. Stable pressure drop characteristics were observed in pulsed and reversed flow blowback modes of operation. Over 4900 hours of operation were obtained with operating conditions ranging up to approximately 90°C and 24 vol % water vapor in the gas stream.

19197 **(DOE/EV/10429—1) Carbon dioxide in Arctic and subarctic regions.** Gosink, T.A.; Kelley, J.J. (Alaska Univ., Fairbanks (USA). Geophysical Inst.). Mar 1981. Contract AT06-80EV10429. 125p. NTIS, PC A06/MF A01.

A three year research project was presented that would define the role of the Arctic ocean, sea ice, tundra, taiga, high latitude ponds and lakes and polar anthropogenic activity on the carbon dioxide content of the atmosphere. Due to the large physical and geographical differences between the two polar regions, a comparison of CO_2 source and sink strengths of the two areas was proposed. Research opportunities during the first year, particularly those aboard the Swedish icebreaker, YMER, provided additional confirmatory data about the natural source and sink strengths for carbon dioxide in the Arctic regions. As a result, the hypothesis that these natural sources and sinks are strong enough to significantly affect global atmospheric carbon dioxide levels is considerably strengthened. Based on the available data we calculate that the whole Arctic region is a net annual sink for about 1.1×10^{15} g of CO_2, or the equivalent of about 5% of the annual anthropogenic input into the atmosphere. For the second year of this research effort, research on the seasonal sources and sinks of CO_2 in the Arctic will be continued. Particular attention will be paid to the seasonal sea ice zones during the freeze and thaw periods, and the tundra-taiga regions, also during the freeze and thaw periods.

19198 **Atmospheric trace element pollutants from coal combustion.** Smith, R.D.; Campbell, J.A.; Felix, W.D. (Battelle Pacific Northwest Labs, Wash). *Mining Engineering (New York)*; **32**: No. 11, 1603-1612(Nov 1980).

Reviewed is a study of the chemical and physical processes affecting the minor and trace element components of coal during combustion and flyash formation. Sixty elements for sized flyash particles from two coal-fired steam plants were evaluated. The larger surface-to-volume ratio of the smaller particles leads to an enrichment of the volatile trace elements. The submicron size particles are of greatest concern environmentally. These particles show the highest concentrations of trace elements; are least efficiently

collected by pollution control devices; have high atmospheric mobilities; and are deposited primarily in the pulmonary and bronchial regions of the respiratory system.

19199 **(EPRI-EA—1733) Comparison of indoor and outdoor air quality. Final report, March 1981.** Moschandreas, D.J.; Zabransky, J.; Pelton, D.J. (Geomet, Inc., Gaithersburg, MD (USA)). Mar 1981. 234p. NTIS, PC A11/MF A01.

Data are presented from a 24-month comprehensive study of the air quality in indoor non-industrial environments. A nine-month field study in the Boston metropolitan area monitored and compared indoor and outdoor air quality at ten residences and two office buildings. Seasonal variations were investigated under real-life conditions. Residences were classified as having indoor sources (gas facilities) or lacking indoor sources (electric facilities). Sulfur dioxide and ozone concentrations were consistently higher outdoors while indoor levels of nonmethane hydrocarbons and carbon dioxide were consistently higher. In general, indoor concentrations of carbon monoxide, nitric oxide, and nitrogen dioxide are greater than corresponding outdoor levels in residences with gas facilities. The indoor concentrations of CO, NO and NO_2 in residences with electric facilities are similar to outdoor levels. Indoor office concentrations of CO, NO and NO_2 usually track outdoor levels. Concentrations of total suspended particulates (TSP) were consistently higher indoors at all residences, but the difference was more pronounced at residences with smoking occupants. Indoor levels of TSP at the office buildings were equal to or slightly below outdoor levels.

19200 **(LA-UR—81-800) Improvement of the sensitivity of opto-acoustic trace gas analysis by condensation.** Slatkine, M. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 6p. (CONF-810630—2). NTIS, PC A02/MF A01.

From 2. international photoacoustic spectroscopy conference; Berkeley, CA, USA (22 Jun 1981).

It is suggested that the minimum detectable concentration of a trace gas in an optoacoustically monitored sample of air could be decreased by five orders of magnitude by condensing the sample and optoacoustically monitoring the liquid phase.

19201 **(LBL—12218) Catalytic oxidation ofS(IV) on activated carbon in aqueous suspension: kinetics and mechanism.** Brodzinsky, R. (Lawrence Berkeley Lab., CA (USA)). Feb 1981. Contract W-7405-ENG-48. 85p. NTIS, PC A05/MF A01.

Thesis.

Activated carbon and combustion produced soot particles have been studied for their catalytic effect on the oxidation of aqueous sulfur(IV) species. Detailed kinetic studies of the reaction were performed on three different activated carbons and on a soot collected in a highway tunnel. Combustion produced soots were tested for their catalytic behavior and found to be similar to the activated carbons. The reaction rate was found to be linearly dependent on the concentration of carbon particles in the solution. The rate was found to follow a Langmuir adsorption isotherm for its dependence on oxygen and the product of two adsorption isotherms for S(IV). The reaction is independent of the pH of the solution when the pH is below 7.6. The reaction does not occur when the pH is above 7.6. The three aqueous S(IV) species are catalyzed in their oxidation by the carbon particles in a similar manner. Activation energies for the reactions on the different carbons are all about 8.5 kcal/mole. A possible four-step reaction mechanism is proposed. It consists of the adsorption of a dissolved oxygen molecule onto the carbon surface, followed by the adsorption of two S(IV) molecules or ions. These are oxidized on the surface to sulfate, which desorbs from the surface, regenerating the catalytically active site.

19202 (LMF—84, pp 183-188) **Effect of source parameters on organic material extractable from diesel particulate emissions.** Royer, R.E.; Clark, C.R.; Marshall, W.F.; Seizinger, D.E.; Naman, T.M. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The differences in the amount of extractable organic material on diesel exhaust particles considered on a per mile basis varied by nearly a factor of two among five different Oldsmobile 350 cars run under identical conditions. Taking this variability into consideration, the measured differences between four car types was not significant. The difference between these four and two others, a Fiat 131 and Audi 5000 was significant. Differences in tests done at different ambient temperatures with various fuels, driving cycles and with hot and cold starts were less than a factor of two.

19203 (LMF—84, pp 211-213) **Microbalance studies on a diesel exhaust particulate sample.** Rothenberg, S.J. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Specific surface areas, desorption half-times and a weight loss curve were determined for a sample of diesel exhaust particulates. Data were obtained over the temperature range 25 to 250°C. Over 40% of the sample weight was material volatile at 250°C and 10^{-6} Torr. The apparent specific surface area was strongly dependent on outgassing temperature, ranging from 17 m^2g^{-1} at 25°C to +5 m^2g^{-1} at 250°C. Desorption half-times exceeded an hour over the entire temperature range studied.

19204 (LMF—84, pp 295-298) **Design and performance of a high temperature/high pressure cascade impactor at ambient conditions.** Barr, E.B.; Newton, G.J.; Carpenter, R.L. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

A 7-stage cascade impactor has been designed and constructed to operate at elevated temperatures and pressures. The cascade impactor design was based on suggested criteria for round hole jets. Both the distance from the jet to the collection surface and the throat depth should be approximately equal to the jet diameter while the flow Reynold's number should be between 500 and 3000. Calibration at ambient conditions verified that the cascade impactor performs predictably.

19205 (LMF—84, pp 301-304) **Evaluation of a deep duct aerosol centrifuge.** Hoover, M.D. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

A deep duct aerosol centrifuge was built and evaluated for use in characterizing aerosol sources and in the production of monodisperse particles. The channel design was similar to that of several short duct centrifuges built and evaluated by Stoeber, and its performance was predicted by theory. The duct was 5 cm deep, 50 cm long and had a constant width of 1.5 cm. Compared to the 3.1 cm deep, 46 cm long expanding spiral duct of the currently used Lovelace Aerosol Particle Separator, the modified design provided up to three times the aerosol sampling rate and a 20% smaller particle cut-off diameter with no loss of resolution.

19206 (LMF—84, pp 501-505) **Behavior of fluid bed aerosol generator as a source of aerosolized fibers.** Carpenter, R.L.; Pickrell, J.A.; Mokler, B.V.; Yeh, H.C.; DeNee, P.B. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

A fluid bed aerosol generator was used to produce respirable aerosols containing predominately single glass fibers. Two fiber types were aerosolized, a large diameter commercial insulation fiber and a smaller diameter experimental glass fiber. Operation of the fluid bed aerosol generator was found to influence the characteristics of the aerosol produced. The aerosol produced changed slowly with time. The median length decreased from 6.9 to 4.7 micrometers in 28 minutes and the aerosol output dropped to a plateau of 10% its initial value after 15 minutes of operation. This output level persists for at least 100 minutes for the smaller fibers.

19207 **Uranium conversion and enrichment technologies: sources of atmospheric fluoride.** Taylor, F.G. (Oak Ridge National Lab., TN); Hetrick, D.M.; Conrad, M.C.; Parr, P.D.; Bledsoe, J.L. Contract W-7405-ENG-26. *Journal of Environmental Quality ;* **10**: No. 1, 80-87(Jan 1981).

To illustrate the proportional hydrogen fluoride (HF) residuals from two nuclear fuel cycle technologies, uranium hexafluoride (UF_6) conversion (feed) and enrichment, air, and vegetation monitoring data were obtained from the Paducah (Kentucky) Gaseous Diffusion Plant (PGDP) from 1972 to 1977, during which the feed manufacturing plant and the diffusion cascade were operating. In the spring of 1977 the feed plant was placed on standby such that effluents containing fluoride came only from the gaseous diffusion operation. Monitoring data obtained without emissions from feed manufacturing (1978) were also obtained. Results indicate the absence of routine releases with observed fluoride concentrations randomly distributed. Ambient concentrations consisted of infrequent peaks superimposed upon a predominant distribution of lower concentrations. The scatter plot, by station, reflects distributions downwind and upwind from the source and identifies the area of greatest impact. Vegetation monitoring data were obtained for the same period (1972-1978), collected every 2 months from 18 locations. The vegetation data were summarized by scatter plots which reflect air quality data, depict ranges in concentration among the monitoring network, and identify the stations with significant fluoride accumulation. Ground-level air (HF) concentrations in the environs of the PGDP were estimated using two dispersion models (Atmospheric Transport Model and Climatological Dispersion Model) and compared to the observed data. The Atmospheric Transport Model estimates were less than the observed concentrations, because the model estimates considered only a single source (gaseous diffusion), whereas the monitoring data incorporated emissions from feed manufacturing and gaseous diffusion operations.

19208 **Forcing technology for hydrocarbon emission control.** Trivedi, G. Frankfort, KY; Department for Natural Resources and Environmental Protection (1979). 11p. (CONF-7909200—1).

From Conference on volatile organic compound emmission control; Atlanta, GA, USA (18 Sep 1979).

A historical perspective is presented on the state of knowledge of the atmospheric chemistry of photochemical oxidants and how EPA regulations have adjusted to this over a period of time. (ACR)

19209 **Control alternatives for volatile organic compounds.** Kenson, R.E. West Chester, PA; OXY-Catalyst, Inc., MET-PRO Corp. (1979). 28p. (CONF-7909200—2).

From Conference on volatile organic compound emmission control; Atlanta, GA, USA (18 Sep 1979).

Viable control concepts that can be applied to the control of volatile organic compounds (VOC's) are discussed. A methodology that can be used to weigh alternatives to arrive at an optimum control for a specific VOC source is presented. The eight alternatives are: thermal incineration; catalytic incineration; steam-stripped carbon adsorption; vacuum-stripped carbon adsorption; absorption/scrubbing; high-energy filtration; low-voltage precipitation; and low-temperature condensation. Advantages and disadvantages of iac are discussed. (JGB)

5003 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 19196, 19224

19210 **(DOE/ET/03425—20) Measurement of airborne radioactivity and its meteorological application. Part VIII. Annual report, 1 August 1976-31 October 1977 .** Reiter, R.; Kanter, H.J.; Sladkovic, R.; Jaeger, H.; Poetzl, K. (Fraunhofer-Gesellschaft zur Foerderung der Angewandten Forschung e.V., Garmisch-Partenkirchen (Germany, F.R.). Inst. fuer Atmosphaerische Umweltforschung). Dec 1980. Contract AC02-76EV03425. 74p. NTIS, PC A04/MF A01.

Studies of the stratospheric-tropospheric exchange were continued. Continuous data of the concentration of cosmogenic radionuclides ^{7}Be, ^{32}P, ^{33}P, as well as of fallout and daily means of ozone concentrations, measured at 3000 m ASL are presented for the reporting period. Installation of two additional ozone measuring stations at 1800 and 740 m ASL provided the means for getting insight into the balance of the tropospheric ozone. First results of routine monitoring of the stratospheric aerosol with a high resolution lidar are shown. Accuracy of the method is discussed. Control of the stratospheric-tropospheric exchange by solar activity is examined with the aid of the key day method using an 8-year measuring sequence. Relevant literature available on the subject is reviewed.

19211 **(DP—1593) Environmental Transport Division. 1980 report.** Adams, S.E.; Fliermans, C.B.; Garrett, A.J.; Halverson, J.E. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Mar 1981. Contract AC09-76SR00001. 64p. NTIS, PC A04/MF A01.

Aquatic, atmospheric, and terrestrial studies and instrumentation developments are described in a series of articles. More details about specific studies are given in publications listed at the end of the report.

19212 **(LA—8776-MS) Radiological criteria for underground nuclear tests.** Malik, J.S.; Brownlee, R.R.; Costa, C.F.; Mueller, H.F.; Newman, R.W. (Los Alamos Scientific Lab., NM (USA)). Apr 1981. Contract W-7405-ENG-36. 27p. NTIS, PC A03/MF A01.

The radiological criteria for the conduct of nuclear tests have undergone many revisions with the current criteria being 0.17 rad for uncontrolled populations and 0.5 rad for controllable populations. Their effect upon operations at the Nevada Test Site and the current off-site protective plans are reviewed for areas surrounding the Site. The few accidental releases that have occurred are used to establish estimates of probability of release and of hazard to the population. These are then put into context by comparing statistical data on other accidents and cataclysms. The guidelines established by DOE Manual Chapter MC-0524 have never been exceeded during the entire underground nuclear test program. The probability of real hazard to off-site populations appears to be sufficiently low as not to cause undue concern to the citizenry.

19213 **(LA—8810-ENV) Environmental surveillance at Los Alamos during 1980.** (Los Alamos National Lab., NM (USA)). Apr 1981. Contract W-7405-ENG-36. 168p. NTIS, PC A08/MF A01.

Documentation is presented for the environmental surveillance program during 1980. Routine monitoring for radiation and radioactive or chemical substances is conducted on the Laboratory site and in the surrounding region to determine compliance with appropriate standards and permit early identification of possible undesirable trends. Results and interpretation of the data for 1980 on penetrating radiation, chemical and radiochemical quality of ambient air, surface and ground water, municipal water supply, soils and sediments, food, and airborne and liquid effluents are included. Comparisons with appropriate standards and regulations or with background levels from natural or other non-Laboratory sources provide a basis for concluding that environmental effects attributable to Laboratory operations are minor and cannot be considered likely to result in any hazard to the population of the area. Results of several special studies describe some unique environmental conditions in the Laboratory environs.

19214 (LMF—84, pp 5-9) **Characterization of an aerosol sample from Three Mile Island reactor auxiliary building.** Kanapilly, G.A.; Stanley, J.A.; Newton, G.J.; Wong, B.A.; DeNee, P.B. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Analyses for radioisotopic composition and dissolution characteristics were performed on an aerosol sample collected on a filter for a week from an air sampler located in the auxiliary building of the Three Mile Island Nuclear plant. The major radioisotopes found on the filter were ^{89}Sr, ^{90}Sr, ^{134}Cs and ^{137}Cs. Rapid in vitro dissolution of greater than 90% of both ^{89} ^{90}Sr and ^{134} ^{137}Cs was found. Scanning electron microscopic analysis showed the presence of respirable size particles as well as larger particles ranging up to 10 μm. The major matrix components were Fe, Ca, S, Mg, Al and Si. Although the radionuclides were present in a heterogeneous matrix, their observed rapid dissolution behavior justified their classification as Class D compounds.

19215 (LMF—84, pp 10-12) **Use of ^{85}Kr to determine specific surface areas of samples requiring glovebox containment.** Rothenberg, S.J.; Eidson, A.F.; Newton, G.J. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The first stages of development of a method of measuring specific surface area, using ^{85}Kr as adsorbate, are reported. Some preliminary data, obtained during manipulative trials on the bench and in the glove box, are presented and the major experimental considerations discussed.

19216 (MHSMP—81-18) **Environmental monitoring report for Pantex Plant covering 1980.** Alexander, R.E.; Laseter, W.A. (Mason and Hanger-Silas Mason Co., Inc., Amarillo, TX (USA)). Mar 1981. Contract AC04-76DP00487. 51p. NTIS, PC A04/MF A01.

This report summarizes the environmental monitoring program at Pantex Plant for 1980. Monitoring data for both radioactive and non-radioactive species in the local environment is presented. Although plant activities involve the handling of significant quantities of uranium, plutonium, and tritium, only small releases of uranium (depleted in the isotope ^{235}U) and tritium occurred which could have affected the local environment. Monitoring data indicate that concentrations of these nuclides in the environment are below established criteria for air and water and therefore do not present a health hazard either to employees or to the public.

5004 Thermal Effluents Monitoring And Transport

REFER ALSO TO CITATION(S) 18546

5005 Site Resource And Use Studies

REFER ALSO TO CITATION(S) 17968, 18116, 18504, 18548, 18549, 18551, 18553, 18555, 18556, 18558

5006 Regulations

REFER ALSO TO CITATION(S) 19066

51 ENVIRONMENTAL SCIENCES, TERRESTRIAL

5101 Basic Studies

19217 (BNL—51331) **Comparison of vegetation patterns and soil nutrient relations in an oak-pine forest and a mixed deciduous forest on Long Island, New York.** Peterson, S.C.; Curtis, P.S. (Brookhaven National Lab., Upton, NY (USA)). Nov 1980. Contract AC02-76CH00016. 28p. NTIS, PC A03/MF A01.

An analysis of soil nutrient relations in two forest communities on Long Island, NY, yielded a correlation between the fertility of the top-soil and vegetational composition. The oak-pine forest soils at Brookhaven National Laboratory contain lower average concentrations of NH_3, Ca, K, and organic matter than the mixed deciduous forest soils in the Stony Brook area. The pH of the top-soil is also more acidic at Brookhaven. The observed differences between localities are greater than within-locality differences between the two soil series tested (Plymouth and Riverhead), which are common to both localities. Nutrient concentrations in the sub-soil are not consistently correlated with either locality or soil series, although organic matter and NH_3 show significantly higher concentrations at Stony Brook. Supporting data on density and basal area of trees and coverage of shrubs and herbs also reveals significant variation between the two forest communities. An ordination of the vegetation data shows higher similarity within than between localities, while no obvious pattern of within-locality variation due to soil series treatments is apparent. These data support the hypothesis that fertility gradients may influence forest community composition and structure. This hypothesis is discussed with reference to vegetation-soil interactions and other factors, such as frequency of burning, which may direct the future development of the Brookhaven oak-pine forest.

19218 (BNL—51332) **Role of temperate forest heterogeneity in determining the population ecology of Peromyscus leucopus.** Ormiston, B.G. (Brookhaven National Lab., Upton, NY (USA)). Nov 1980. Contract AC02-76CH00016. 9p. NTIS, PC A02/MF A01.

Population density levels of small mammals are often roughly correlated with local forest productivity. In a highly productive forest the total number of individual small mammals (all species) may exceed 100/hectare. Low productivity forests may harbor few or none at all. Thus, the potential exists for using small mammal populations as indicators of local forest composition and quality. Changes in the density levels of species used for this purpose (indicator species) may so reflect the dynamics of forest structure and productivity. The white-footed mouse, Peromyscus leucopus, is common in temperate deciduous forests throughout the northeastern United States. Its ubiquitous distribution is a required feature for studying the effects of variation in forest components upon a representative consumer. The goal of this study was to collect baseline data on P. leucopus populations responding to spatial and temporal forest heterogeneity, and so evaluate its potential as an indicator species.

19219 **Estimating coyote food intake from undigested residues in scats.** Johnson, M.K.; Hansen, R.M. (Colorado State Univ., Fort Collins). *American Midland Naturalist ;* **102**: No. 2, 363(6 Oct 1978).

Average dry weights per occurrence in a coyote (Canis latrans) scat were determined for undigested fractions of mammals, birds, reptiles, arthropods, plants and seeds. Dry weights of these items are useful for estimating biomass originally ingested. Normalizing data produce an estimate of the coyote dietary. If coyote population densities and food intake rates were known, estimates of relative biomass taken from each prey population could be obtained.

19220 **Observations on coyote-mule deer interactions at Rocky Flats, Colorado.** Alldredge, A.W.; Arthur, W.J. III. *American Midland Naturalist ;* **103**: No. 1, 200-201(Jan 1980).

Observations of interactions between coyotes (Canis latrans) and mule deer (Odocoileus hemionus) in N-central Colorado indicated that, upon discovering a coyote close to a herd, mule deer would become alert, bunch together and either flee or pursue the coyote. Two observations of coyotes attacking deer indicated that the rump was the probable point of attack and in one case the deer began a defense using its front hooves.

19221 (LA—8529-NERP) **Biotelemetry studies on elk.** White, G.C. (Los Alamos Scientific Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 26p. NTIS, PC A03/MF A01.

The movements of Rocky Mountain elk (Cervus elaphus nelsoni) in the eastern Jemez Mountains in north-central New Mexico were studied from 1978 to 1980. Thirty-six elk were trapped, marked, and released, and 30 of these animals were radio-collared. The June 1977 la Mesa fire created a wintering habit at that was used heavily by the radio-collared elk. The 10-year-old clear cuts on Cerro del Medio on the Baca Land and Cattle Company property were used for calving and nursing areas. In general, radio-collared elk used in an early successional state, and they did not use areas at the Los Alamos National Laboratory where there was human activity.

5102 Chemicals Monitoring And Transport

19222 (UCRL—53109) **SILVA: a model for forecasting the effects of SO_2 pollution on growth and succession in a western coniferous forest.** Kercher, J.R.; Axelrod, M.C. (Lawrence Livermore National Lab., CA (USA)). 26 Feb 1981. Contract W-7405-ENG-48. 80p. NTIS, PC A05/MF A01.

A forest succession simulator, SILVA, has been developed for the mixed conifer forest type of the Sierra Nevada, California

(seven major species), to simulate the effects of SO_2 on forest dynamics. SILVA was developed by extensively modifying a northeastern US simulator. The model simulates growth and includes the development in time of tree diameter, tree height, leaf area index, and available light for each tree. Recruitment and mortality are modeled stochastically. Modifications include the introduction of fire ecology and the use of temporal seed-crop patterns and seedling survival factors unique to Sierra Nevada forests. Probability of mortality is determined by height of crown scorch (which is a function of fire intensity), dbh, and bark thickness. Pollutant impacts are modeled as an effect on tree growth. Dose-response functions relating change in tree growth to increases in pollutant loads were developed using published data. The model simulates community dynamical and structural response to many factors quite well. For 500-year simulations from clearcut, the ratios of the time-averaged basal area fraction of Pinus ponderosa to Abies concolor were 5.2:1 and 1:16 for elevations of 1524 m and 1829 m, respectively. At 1524 m, the ratio of P. ponderosa to A. concolor decreased 59% with the introduction of fire suppression. To investigate effects of low-level chronic SO_2 fumigation in sample runs, the pollutant level is set to cause these annual reductions in growth: P. ponderosa, 10%; Pseudotsuga menziesii, 18%; and SO_2-tolerant species such as A. concolor, 1 to 2%. Time-averaged P. ponderosa basal area fraction decreased 28% and A. concolor (SO_2 tolerant) increased by 260% at 1524 m elevation. Three scenarios of pollutant time histories are investigated: rising levels, constant levels, and rising and falling levels. We also calculate the sensitivities of the model parameters to determine relative importance for model behavior.

19223 Survey of sorption relationships for reactive solutes in soil. Travis, C.C.; Etnier, E.L. (Oak Ridge National Lab., TN). Contract W-7405-ENG-26. *Journal of Environmental Quality ;* **10**: No. 1, 8-17(Jan 1981).

The present study provides a survey of relationships in current use to quantify sorption of reactive solutes by soil. Its purpose is to examine present concepts and to indicate active research directions. Both equilibrium and first-order kinetic sorption models are reviewed. Equilibrium models discussed include the linear, Freundlich, Langmuir, two-surface Langmuir, and competitive Langmuir isotherms. Kinetic sorption models reviewed are the reversible linear, reversible nonlinear, kinetic product, bilinear, mass transfer, Elovich, Fava and Eyring, and two-site kinetic model. The models reviewed appear to provide a reasonably good basis for extrapolation and interpolation of data. There is a continuing need, however, to upgrade these methodologies as demand for accuracy and realism increases. It is expected that the state-of-the-art review provided by this survey will assist in this process.

5103 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 19211, 19213, 19216, 19240

19224 (ANL—81-23) Environmental monitoring at Argonne National Laboratory. Annual report for 1980. Golchert, N.W.; Duffy, T.L.; Sedlet, J. (Argonne National Lab., IL (USA)). Mar 1981. Contract W-31-109-ENG-38. 90p. NTIS, PC A05/MF A01.

The results of the environmental monitoring program at Argonne National Laboratory for 1980 are presented and discussed. To evaluate the effect of Argonne operations on the environment, measurements were made for a variety of radionuclides in air, surface water, soil, grass, bottom sediment, and foodstuffs; for a variety of chemical constituents in air, surface water, and Argonne effluent water; and of the environmental penetrating radiation dose. Sample collections and measurements were made at the site boundary and off the Argonne site for comparison purposes. Some on-site measurements were made to aid in the interpretation of the boundary and off-site data. The results of the program are interpreted in terms of the sources and origin of the radioactive and chemical substances (natural, fallout, Argonne, and other) and are compared with applicable environmental quality standards. The potential radiation dose to off-site population groups is also estimated.

19225 (DOE/EV/10206—2) Geochemical determination of biospheric CO_2 fluxes to the atmosphere. Annual progress report, June 1, 1979-August 31, 1981. Stuiver, M. (Washington Univ., Seattle (USA)). 24 Mar 1981. Contract AT06-79EV10206. 95p. NTIS, PC A05/MF A01.

Research progress is reported - for an investigation of aspects of the carbon cycle through the use of C13/C12 and C14/C12 abundance ratios. The objective is to increase knowledge of past biospheric carbon reservoir changes that have resulted in increases or reductions of atmospheric CO_2 levels. C13 trends in trees from Kodiak Island, Alaska, and from Chile were determined. (ACR)

19226 (EGG—1183-1769) Aerial radiological survey of the Davis-Besse Nuclear power Station and surrounding area, Oak Harbor, Ohio. Date of survey: 26-29 May 1980. Hilton, L.K. (EG and G, Inc., Las Vegas, NV (USA). Energy Measurements Group). Dec 1980. Contract AC08-76NV01183. 11p. NTIS, PC A02/MF A01.

An airborne radiological survey of a 130 km^2 area centered on the Davis-Besse Nuclear Power Station was made 26-29 May 1980. Count rates observed at 90 m altitude were converted to exposure rates at 1 m above the ground and are presented in the form of an isopleth map. Detected radioisotopes and their associated gamma ray exposure rates were consistent with that expected from normal background emitters, except directly over the station.

19227 (EGG—1183-1775) Aerial radiological survey of the Fermi National accelerator Laboratory and surrounding area, Batavia, Illinois. Data of survey: 12-14 May 1977. Jobst, J.E. (EG and G, Inc., Las Vegas, NV (USA). Energy Measurements Group). Jan 1981. Contract AC08-76NV01183. 30p. NTIS, PC A03/MF A01.

An aerial radiological survey was conducted over the facilities of the Fermi National Accelerator Laboratory (Fermilab) near Batavia, Illinois on 12-14 May 1977. The survey was flown at an altitude of 91 m by a helicopter containing 20 sodium iodide detectors. The line spacing was also 91 m. Enhanced gamma exposure rate levels, which could be attributed to Fermilab operations, were observed at seven locations. One additional anomaly, not related to the Laboratory, was also discovered.

19228 (LBL—11616(Vol.1)) Migration of radionuclides through sorbing media analytical solutions - II. Pigford, T.H.; Chambre, P.L.; Albert, M. (Lawrence Berkeley Lab., CA (USA)). Oct 1980. Contract W-7405-ENG-48. 231p. NTIS, PC A11/MF A01.

This report presents analytical solutions, and the results of such solutions, for the migration of radionuclides in geologic media. Volume 1 contains analytical solutions for one-dimensional equilibrium transport in infinite media and multilayered media. One-dimensional non-equilibrium transport solutions are also included. Volume 2 contains analytical solutions for transport in a one-dimensional field flow with transverse dispersion as well transport in multi-dimensional flow. A finite element solution of the transport of radionuclides through porous media is discussed. (DMC)

19229 (RHO-SA—214) Sorption of trace cesium on 21 Hanford Site sediment types. Routson, R.C.; Barney, G.S.; Smith, R.M.; Delegard, C.A. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Mar 1980. Contract AC06-77RL01030. 13p. (CONF-810348—1). NTIS, Q A02/A01.

From Northwest Scientific Association meeting; Corvallis, OR, USA (26 Mar 1981).

Sorption of trace cesium (Cs) was measured on 21 Hanford Site sediment types. A Box-Behnken statistical design was used to develop empirical-statistical equations predicting ^{137}Cs sorption as a function of the equilibrium concentrations of macroions Na^+, K^+, and Ca^{+2} in solution over the concentration ranges of 3.0 to 0.001M, 0.2 to 0.002M, and 0.2 to 0.002M, respectively. These equations are required to estimate trace Cs transport from Hanford ground disposal sites. Average Cs sorption equations for the 21 sediments will be presented and discussed.

19230 (UCRL—84501) Remote sensing of soil radionuclide fluxes in a tropical ecosystem. Clegg, B.; Koranda, J.; Robinson, W.; Holladay, G. (Lawrence Livermore National Lab., CA (USA)). 6 Nov 1980. Contract W-7405-ENG-48. 7p. NTIS, PC A02/MF A01.

We are using a transponding geostationary satellite to collect surface environmental data to describe the fate of soil-borne radionuclides. The remote, former atomic testing grounds at the Eniwetok and Bikini Atolls present a difficult environment in which to collect continuous field data. Our land-based, solar-powered microprocessor and environmental data systems remotely acquire measurements of net and total solar radiation, rain, humidity, temperature, and soil-water potentials. For the past year, our water flux model predicts wet season plant transpiration rates nearly equal to the 6 to 7 mm/d evaporation pan rate, which decreases to 2 to 3 mm/d for the dry season. Radioisotopic analysis confirms the microclimate-estimated 1:3 to 1:20 soil to plant ^{137}Cs dry matter concentration ratio. This ratio exacerbates the dose to man from intake of food plants. Nephelometer measurements of airborne particulates presently indicate a minimum respiratory radiological dose.

19231 Chemical treatments of soil to decrease radiostrontium leachability. Spalding, B.P. (Oak Ridge National Lab., TN). Contract W-7405-ENG-26. *Journal of Environmental Quality ;* **10**: No. 1, 42-46(Jan 1981).

The leachability of radiostrontium from radioactive waste and through soil is one of the most salient problems with shallow-land burial as a disposal method. The continuous leaching of buried waste at the Oak Ridge National Laboratory (ORNL), for periods up to 30 years, by lateral ground water flow has led to the contamination of surrounding soils and streams with ^{90}Sr. The goal of the present investigation was to evaluate methods to effect either the in situ fixation or reduced leachability of ^{90}Sr in soil. Small columns of three soils, collected from the solid waste disposal areas at ORNL, were labeled with ^{85}Sr as a convenient tracer for ^{90}Sr. After this labeling, but prior to leaching, the soil columns were percolated with equivalent amounts of sodium salt solutions of hydroxide, fluoride, carbonate, phosphate, silicate, or aluminate. Leaching was then initiated with 0.1N $CaCl_2$ which was selected to qualitatively simulate ground water which contains Ca as the dominant dissolved cation. With two soils, high in indigenous exchangeable Ca^{2+}, only 30 to 35% of the ^{85}Sr could be leached from the carbonate-treated columns. Presumably, the ^{85}Sr was coprecipitated with the nascent $CaCo_3$ formed during this treatment. In contrast, >98% of the ^{85}Sr was readily leached from all untreated soils. Other anions fixed variable but generally less ^{85}Sr than the carbonate treatment. Thus, sodium carbonate appears to have a potential application to immobilize ^{90}Sr in situ in contaminated soil.

5105 Site Resource And Use Studies

REFER ALSO TO CITATION(S) 17940, 17968, 18115, 18116, 18504, 18548, 18549, 18550, 18551, 18552, 18553, 18554, 18555, 18556, 18557, 18558, 18610, 18611, 19395, 19396, 19401, 19403

52 ENVIRONMENTAL SCIENCES, AQUATIC

5201 Basic Studies

REFER ALSO TO CITATION(S) 18341, 19241, 19242, 19243, 19413

19232 Limiting role of phosphorus in a woodland stream ecosystem: effects of P enrichment on leaf decomposition and primary producers. Elwood, J.W.; Newbold, J.D.; Trimble, A.F.; Stark, R.W. (Oak Ridge National Lab., TN). Contract W-7405-ENG-26. *Ecology ;* **52**: No. 1, 146-158(Feb 1981).

The limiting role of phosphorus on leaf decomposition and primary producers was investigated in a second-order woodland stream in Tennessee by experimentally enriching, for 95 d, adjacent reaches with an average of 60 and 450 μg PO_4-P/L, respectively, over upstream control levels of ≃ 4 μg/L. Red Oak (Quercus rubra) leaf packs in the enriched sections lost mass 24% faster than control packs ($P < .05$). Nitrogen content of the enriched packs increased 60% more, and P content increased 83% more than the respective increases in the control packs ($P < .05$). Differences in mass loss and N and P levels between the low and high enrichments were not significant ($P > .05$). Respiration rates of subsampled leaf discs were significantly higher than control rates only at the high level of enrichment. The increased respiration rates in the low and high enrichments accounted for 10 and 34% of the increased mass loss in the respective enriched sections, suggesting that the enrichment also produced increases in mechanical breakdown through faster microbial conditioning, increases in macroinvertebrate feeding, or both. Effects of the enrichment on aufwuchs initially consisted of increased chlorophyll a levels, followed by increased aufwuchs biomass levels. Dense growth of filamentous algae, including some Oscillatoria, which may be a nitrogen fixer, developed immediately downstream of P inputs. In addition, Nostoc, a known nitrogen-fixing blue-green alga, sampled after the enrichment, was significantly more abundant in the enriched sections than the control ($P < .05$). Densities of the snail, Goniobasis clavaeformis, a grazer-shredder sampled after the enrichment, also were significantly greater in the enriched reaches, suggesting that the lack of a sustained response of chlorophyll a to the enrichment may have been a result of increased grazing on algal biomass.

5202 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 17937, 18067, 19213, 19224

19233 (BNL—29406) Multiobjective reservoir optimization via lake stratification modeling and constrained nonlinear programming. Kaplan, E. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 20p. (CONF-810634—1). NTIS, PC A02/MF A01.

From International symposium on real-time operation of hydrosystems; Waterloo, Ontario, Canada (24 Jun 1981).

This paper presents an approach whereby the natural process of stratification may be used to control the operation of a reservoir such that water quality (both within and released from the reservoir) is maximized while constraints are met on other beneficial uses (e.g., flood control, pumped storage hydroelectric generation, recreation, etc.). The idea is to use any existing lake stratification model to provide a state vector Psi of the reservoir's depth dependent water quality at time t. An objective function is formulated using water quality index for the reservoir (WQI)/sub R/ and its discharge (WQI)/sub D/. A constrained nonlinear optimization problem is formulated which uses Psi(t) and expected values of inflow during interval Δt to maximize (WQI)/sub R/ and (WQI)/sub D/ at time t + Δt, under the time dependent constraints operating during Δt. The stratification model then gives Psi(t + Δt), assuming the optimal discharge is performed, with the procedure thus continuing for the next Δt.

19234 (DOE/EV/10429—2) Carbon dioxide in Arctic and subarctic regions. Gosink, T.A.; Kelley, J.J. (Alaska Univ., Fairbanks (USA). Geophysical Inst.). Feb 1981. Contract AT06-80EV10429. 23p. NTIS, PC A02/MF A01.

Research progress is reported on an investigation of sea surface water partial pressure of CO_2 between Greenland and Franz Joseph's Land. (ACR)

19235 (DOE/PC/30246—T1) Adsorptive behavior of polycyclic aromatic hydrocarbons in coal-conversion wastewaters. Six months progress report. Walters, R.W.; Luthy, R.G. (Carnegie-Mellon Univ., Pittsburgh, PA (USA). Dept. of Civil Engineering). 1981. Contract FG22-80PC30246. 49p. NTIS, PC A03/MF A01.

A coupled column system was designed and assembled for use in solubility and adsorption testing. This system consists of a saturated solution generation column and an adsorption column. The generation column has been employed successfully to determine the solubility behavior of naphthalene; for nine determinations at 25 °C the aqueous solubility is 32.9 +- 1.2 milligrams per liter. However, adsorption isotherm data obtained from the coupled column system involved techniques which are limited by time constraints and accuracy. Batch adsorption shake testing using the generation column to prepare solutions offers an acceptable alternative to this sytem. This procedure has been employed to obtain adsorp-

tion isotherm data for naphthalene. Thirty-one data points were obtained for equilibrium concentrations from 0.00689 to 18.8 milligrams per liter. These data can be fitted to the Freundlich equation with constant values of 263 for the coefficient and 0.39 for the exponent. Adsorption and adsorption isotherm models which are more appropriate than the Freundlich equation for purposes of detailed modelling are reviewed.

5203 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 19211, 19213, 19216, 19224, 19228, 19231, 19244, 19416

19236 (DOE/ER/02271—T1) Coral growth rings and the temporal history of nuclear $^{14}C/C$ $^{90}Sr/Sr$ in the surface ocean. Progress report, February 1, 1980-January 31, 1981. Broecker, W.S.; Fairbanks, R.G. (Columbia Univ., Palisades, NY (USA). Lamont-Doherty Geological Observatory). Sep 1980. Contract AC02-76ER02271. 95p. NTIS, PC A05/MF A01.

Research Progress is reported for the period February 1980 through January 1981. 129 coral samples have been collected from the Atlantic, Pacific, and Indian Oceans. Three Strontium 90 records, one each from Bermuda, Oahu and Tarawa, have been generated. Models have been constructed and tested which are used to reproduce the essential features of the coral ^{90}Sr and ^{14}C time histories. (ACR)

19237 (DOE/EV/70030—4) Cycling of transuranic radionuclides in the Columbia River, its estuary and the northeast Pacific ocean. Progress report, February 1980-February 1981. Beasley, T.M. (Oregon State Univ., Corvallis (USA). School of Oceanography). 1981. Contract AT06-76EV70030. 25p. (RLO—2227/T30-4). NTIS, PC A02/MF A01.

This report summarizes progress from February 1980 through January 1981 in research dealing with the behavior of transuranic and other radionuclides in the Columbia River downstream of the Hanford Reservation. Principal efforts during this period have dealt with finalizing the analyses of Columbia River cores for transuranic and other radionuclides, completion of the analyses of offshore cores and the acquistion of mass spectrometry data for Pu isolated from Columbia River sediments. We have, in addition, completed the analyses of cores from anoxic basins to test the theory of anionic complexone remobilization of transuranic radionuclides.

19238 (MLM—2819) Potable water standards project. Final report. Styron, C.E.; Meyer, H.E. (Mound Facility, Miamisburg, OH (USA)). 7 Apr 1981. Contract AC04-76DP00053. 215p. NTIS, PC A10/MF A01.

Under regulations known as the National Interim Primary Drinking Water Regulations, Title 40 - Code of Federal Regulations, Part 141, which became effective on June 24, 1977, the new standard for tritium in public drinking water (20 nCi/l) was 50 times lower than the Radioactivity Concentration Guide (RCG) in use by DOE. At that time it was apparent from data collected in the environmental surveillance program that three Mound wells and nine nearby private and community wells would be out of compliance, in some cases by a factor as high as four. Recognizing that previous actions taken to reduce the levels of tritium in airborne and liquid effluents would have to be supplemented by intensive efforts in order to bring tritium concentrations in local drinking water supplies into compliance with the EPA standard, the Potable Water Standards Project was initiated. A six-phase program was developed for achieving the goals of the project. Phase I had three parts: analyze all pertinent historical data on geohydrology and tritium in the environment for clues to the source or sources of tritium reaching the aquifer; determine needs for additional data to identify the source(s) of tritium; and define and initiate a rainout monitoring program to obtain data to be used in Phase III. Research in the other five phases was divided into the following categories: conduct a field program involving additional test borings, observation wells, and monitoring to obtain required data to identify source(s); model data, evaluate results, and identify source(s) of tritium; develop a program of corrective action to curtail or eliminate the source(s) of tritium; implement the program of corrective action; and evaluate subsequent monitoring data to ensure that correction has been achieved. (JGB)

19239 (PNL—3768) Radiological status of the ground water beneath the Hanford Site, January-December 1980. Eddy, P.A.; Wilbur, J.S. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Apr 1981. Contract AC06-76RL01830. 117p. NTIS, PC A06/MF A01.

Operations at the Hanford Site since 1944 have resulted in the discharge to the ground of large volumes of process cooling water and low-level liquid radioactive waste. Radioactivity and chemical substances have been carried with these discharges and have reached the Hanford ground water. For many years wells have been used as ground-water sampling structures to gather data on the distribution and movement of these discharges as they interact with the unconfined ground water beneath the Hanford Site. During 1980, 317 such structures were sampled at various times for radionuclide and chemical contaminants. Data collected during 1980 describe the movement of tritium and ruthenium-106 and the nonradioactive nitrate plume as well as their response to the influences of ground-water flow, ionic dispersion, and radioactive decay.

19240 Time pattern of off-site plutonium deposition from rocky flats plant by lake sediment analyses. Hardy, E.P.; Volchok, H.L.; Livingston, H.D.; Burke, J.C. *Environment International ;* **4**: No. 1, 21-30(1980).

The Rocky Flats Plant in Golden, Colo., is a government-owned nuclear weapons production facility. In an effort to establish a pollution history of the area surrounding the plant, a sediment core from a lake downwind of Rocky Flats was analyzed. Core sections were dated by analyses of cesium-137, plutonium-239,240, plutonium-238, and americium-241 fallout from nuclear testing and plutonium-238 fallout from a satellite failure. A peak in transuranic concentrations in late 1969 was attributable to the plant. Mass isotopic analysis of plutonium isotopes in selected core segments confirmed this finding. (5 diagrams, 1 graph, 31 references, 2 tables)

5204 Thermal Effluents Monitoring And Transport

REFER ALSO TO CITATION(S) 18545

5205 Site Resource And Use Studies

REFER ALSO TO CITATION(S) 17968, 18104, 18116, 18548, 18549, 18551, 18552, 18555, 18556, 18558, 18610, 18611, 19386, 19414, 19415, 19416, 19417, 19419, 19420, 19423

19241 (SAND—80-2577(Vol.2)(Pt.2), pp 395-438) **Appendix U: benthic biological studies.** Hessler, R.R. Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 2 of 2.

Characterization of the biology and standing crop of the benthic organisms is divided into two major categories: (1) those organisms (sessile or with limited mobility) that live on or within the sediment (infauna); and (2) highly mobile organisms that have contact (if only occasionally) with the sediment (benthopelagic organisms). At this time our studies of benthopelagic organisms are restricted to amphipods. The amphipods trapped at MPG-I (30 to 31°N, 159°W) in 1978 have been sorted to species and compared with those trapped at Climax II (28°N, 155 to 156°W) in 1977. The species composition is the same at both stations and the numerical representation of the various species appears to be equivalent. Instar categories based on morphological and size criteria have been determined for Eurythenes gryllus. Comparison of the size range of the instar categories, morphological characters and female to male ratio show no detectable differences in E. gryllus from the two areas. Individuals of one of the smaller species of amphipods (Paralicella caperesca) were trapped at 710 m above the sediment, demonstrating that although the primary range of this species is 0-1 m off the bottom, it is capable of wide bathymetric movements. Males mature at a much smaller size (7 cm vs 11.5 cm) than fe-

males. Females appear to breed only once while males seem to be reproductively mature for several instars. After attaining maturity, male growth decreases to almost half the previous rate, and the time interval between molts appears to increase substantially. Females approximate a linear growth rate throughout their instar stages. The data are insufficient to determine if a decrease in growth rate occurs at the molt to maturity (female 14). The apparent difference in the time to maturity for males and females results in a high number of mature males present in the population to fertilize relatively few females.

19242 (SAND—80-2577(Vol.2)(Pt.2), pp 439-464) **Appendix V: property acquisition and model development for biological uptake and movement of radionuclides in the oceans.** Smith, K. Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 2 of 2.

This research is concerned with measuring the activity rates of populations and communities of organisms and sampling the abyssopelagic fauna which occupy the deep-sea benthic boundary layer. This research can be divided into two broad components: (1) the sediment community; and (2) the benthopelagic and/or abyssopelagic fauna. Sediment community metabolism in the MPG-I area ranges from 0.07 to 0.15 ml O_2 $m^{-2}hr^{-1}$. These rates are comparable to similar measurements made at oligotrophic western North Atlantic stations. Nutrient flux measurements across the sediment-water interface reveal considerable variation with a general trend showing release of NH_4, NO_3, and NO_2 from the sediments. These flux rates are lower than those measured in the western North Atlantic. Abyssopelagic faunal sampling with a free vehicle gill net and baited trap system in the MPG-I area imply active vertical transport of food energy between the bottom and midwater depths up to 1220m altitude.

19243 (SAND—80-2577(Vol.2)(Pt.2), pp 465-520) **Appendix W: deep sea biophysics (microbiology and amphiped studies).** Yayanos, A.A. (Univ. of California, La Jolla). Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 2 of 2.

CNPT-3 is the laboratory designation of a strain of bacteria that reproduces best at deep-sea pressures. It was isolated from a sample collected at a 5800 m depth of the Pacific Ocean. This isolation was achieved from a sample that had been retrieved without warning. This year we demonstrated that there are similarly behaving bacteria that can be isolated from samples even when retrieved with decompression. The purpose of this project was to define the temperatures and pressures over which CNPT-3 can exist and function. (1) At 2°C CNPT-3 is eurybathic from about 1000 to 6500 m, as judged from an only slightly pressure dependent generation time. (2) CNPT-3 is unquestionably barophilic at 2°C, with doubling times of 9 hours at 580 bars and over 18 hours at 1 bar. (3) At 10°C, reproduction is adversely affected at 1 bar to the extent that CNPT-3 becomes obligately barophilic at 10°C. Yet reproduction is enhanced above 280 bars and occurs with a regeneration time of 4 hours at 690 bars and 7 hours at 930 bars. (4) The loss of colony forming ability at 10°C is very slow but very rapid at 32°C with 10^6 colony forming units being lost in less than one hour. The activation energy for thermal inactivation was 43 Kcal. Two hypotheses may be tenable One is that most of the important deep-sea abyssal plain bacteria are barophilic. The other is that most of the published literature on the properties and characteristics of deep-sea bacteria has been generated with spurious deep-sea bacteria. At the end of the year cultures of CNPT-3 were irradiated with cobalt-60 gamma rays. Early results suggest that it may not be unusually radiosensitive. Technique development this year included: completion of the first stage of a high pressure microbial cultivation facility; procurement of the first stage of an image analysis system; and, completion of the fabrication of two pressure retaining amphipod traps.

19244 (SAND—80-2577(Vol.2)(Pt.2), pp 521-598) **Appendix X: biotransport model development.** Jackson, D.W. Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 2 of 2.

Falcon Research and Development Company activities in support of radionuclide biotransport model development are in-progress and no findings are reported regarding environmental feasibility assessment. Data have been assembled from SDP participants and literature review, algorithms developed and input data calculated for initial runs of the biotransport model which is near completion. Additionally, a review of pertinent modeling literature has been completed and is presented in the annual report.

53 ENVIRONMENTAL-SOCIAL ASPECTS OF ENERGY TECHNOLOGIES

REFER ALSO TO CITATION(S) 18730

5301 Social And Economic Studies

REFER ALSO TO CITATION(S) 19247

19245 **Energy prices, inflation, and economic activity.** Mork, K.A. (ed.). Cambridge, MA; Ballinger Publishing Company (1981). 180p. (CONF-7911142—).

From Conference on energy prices, inflation, and economic activity; Cambridge, MA, USA (9 Nov 1979).

These essays encompass a wide variety of approaches to the energy market, ranging from large econometric models to more direct, innovative approaches. The large models, used for short-term forecasting and policy analysis long before the oil embargo, have been adapted here to energy price shocks and supply interruptions. The more innovative approaches, while lacking the great detail of the other models, directly address the specific economic problems of energy price shocks. The contributors trace the effects of energy price changes on inflation, unemployment, and economic growth. They find that traditional macroeconomic policies - such as personal income tax cuts, government spending programs, and expansionary monetary policies - are unsuitable for offsetting the combination of inflation and recession that follows energy price shocks. Instead, they suggest alternative measures such as payroll tax cuts and tax incentives for investment. The findings show, however, that while the short-run adjustment to energy price shocks can be eased by the proper choice of macroeconomic policy, little can be done to improve the prospects for long-term economic growth.

19246 **Acceptable risks: occupational health in the nuclear industry.** Brown, M.S. Ithaca, NY; Cornell University (1980). 118p.

Thesis.

This thesis examines the risk of working in the nuclear power industry. It reviews the history of the industry, government regulatory activities, and current scientific evidence of the health effects of radiation exposure. A discussion of current controversies over reduction in exposure limits is presented along with an analysis of the issues and problems associated with determinations of acceptable workplace risks. The thesis analyzes the controversy in terms of the acceptability of risk. The question of acceptability does not lend itself to technical evaluations of risks, costs, and benefits but is a social judgment of the necessity of a particular occupation or industry in society. At issue is the level of profits foregone by reductions in risk. This document concludes that the legitimacy of decisions about acceptable risks rests on the informed participation of all interested parties, including workers, in a process of defining socially necessary production. There must be opportunities to refuse higher risk jobs without losing a livelihood and adequate compensation for workers who accept hazardous jobs for the benefit of society.

5302 Assessment Of Energy Technologies

19247 (PNL—3700(Pt.5)) Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 5. Environmental assessment, control, health and safety. Baalman, R.W.; Hays, I.D. (eds.). (Battelle Pacific Northwest Labs., Richland, WA (USA)). Feb 1981. Contract AC06-76RL01830. 91p. NTIS, PC A05/MF A01.

Pacific Northwest Laboratory's (PNL) 1980 annual report to the DOE Assistant Secretary for Environment describes research in environment, health, and safety conducted during fiscal year 1980. Part 5 includes technology assessments for natural gas, enhanced oil recovery, oil shale, uranium mining, magnetic fusion energy, solar energy, uranium enrichment and industrial energy utilization; regional analysis studies of environmental transport and community impacts; environmental and safety engineering for LNG, oil spills, LPG, shale oil waste waters, geothermal liquid waste disposal, compressed air energy storage, and nuclear/fusion fuel cycles; operational and environmental safety studies of decommissioning, environmental monitoring, personnel dosimetry, and analysis of criticality safety; health physics studies; and epidemiological studies. Also included are an author index, organization of PNL charts and distribution lists of the annual report, along with lists of presentations and publications. (DLS)

5303 Environmental Impact Statements

REFER ALSO TO CITATION(S) 18504, 18549, 18550, 18552, 18554

55 BIOMEDICAL SCIENCES, BASIC STUDIES

5501 Behavioral Biology

19248 Persistence and stability of seed-dispersed species in a patchy environment. DeAngelis, D.L.; Travis, C.C.; Post, W.M. (Oak Ridge National Lab., TN). Contract W-7405-ENG-26. *Theoretical Population Biology ;* **16**: No. 2, 107-119(Oct 1979).

A mathematical model is developed for the dynamics of seed-dispersed tree species in a region of forest patches or islands. The relevant variables are the population numbers of individual species populations on each patch. A model that considers only one tree species (of the many present) in a region of N distinct patches is formally analogous to a model of an N-species mutualistic community. Using the theory of M-matrices, which has been successfully applied to mutualistic communities, criteria for persistence and stability of the species are derived. The model is then extended to a community of L species that interact competitively and mutualistically in an N-island region. The possibilities of obtaining numerical parameters for the models are discussed.

5502 Biochemistry

REFER ALSO TO CITATION(S) 19266, 19268, 19269, 19270, 19319, 19373

19249 (DOE/ER/04967—3) Gene enzyme relationships in somatic cells and their organismal derivatives in higher plants. Progress report. Jensen, R.A. (State Univ. of New York, Binghamton (USA)). 1981. Contract AS02-78ER04967. 13p. NTIS, PC A02/MF A01.

This renewal proposal describes preliminary results on the isolation and characterization of a new amino acid, spiro-arogenate. The preparation of ^{14}C-L-arogenate and an improved assay for arogenate dehydratase are described. The remainder of the proposal deals with the cell biology of Nicotiana. (KRM)

19250 Vacuolar deposition of ascorbate-derived oxalic acid in barley. Wagner, G.J. (Brookhaven National Lab., Upton, NY). *Plant Physiology ;* **67**: No. 3, 591-593(Mar 1981).

L-[1-^{14}C]Ascorbic acid was supplied to detached barley seedlings to determine the subcellular location of oxalic acid, one of its metabolic products. Intact vacuoles isolated from protoplasts of labeled leaves contained [^{14}C]oxalic acid which accounted for about 70% of the intraprotoplast soluble oxalic acid. Tracer-labeled oxalate accounted for 36 and 72% of the ^{14}C associated with leaf vacuoles of seedlings labeled for 22 and 96 hours, respectively.

19251 Single-electron reactions of vitamin B/sub 12s/: reduction of chromium(III) complexes. Espenson, J.H.; Gjerde, H.B. (Iowa State Univ., Ames). Contract W-7405-ENG-82. *Inorganic Chemistry ;* **19**: No. 11, 3549-3550(Nov 1980).

The kinetics of the reduction of a family of Cr(III) complexes with vitamin B/sub 12s/ is reported here. The vitamin B/sub 12s/, abbreviated as [Co/sup I/]$^-$ is unstable toward hydrogen evolution in neutral or acidic solutions, and for this work the B/sub 12s/ was generated electrochemically at pH 2.5 to 3.2 in aqueous glycine buffers to yield reasonably stable solutions. The Cr(III) complexes studied were $(H_2O)_5CrX^{2+}$ where X = F^-, Cl^-, Br^-, N_3^-, NCS^-, OAc^-, SH^-, and OH^-. The reaction proposed for the reduction is [Co/sup I/]$^-$ + $(H_2O)_5CrX^{2+}$ → [Co/sup II/] + Cr^{2+}(aq) + X^-, and the 1:1 stoichiometry shown in this equation was confirmed by spectrophotometric titration. The reaction between vitamin B/sub 12s/ and each of the CrX^{2+} species follows a second-order rate equation. The kinetic data for the reaction of each species are tabulated, and the reaction rates appear to be pH independent indicating the B/sub 12s/ rather than the B/sub 12r/ and B/sub 12a/ is the reactive species. An inner-sphere activated complex is suggested as the electron-transfer vehicle. (BLM)

19252 Uncoupled regulation of fibronectin and collagen synthesis in Rous sarcoma virus transformed avian tendon cells. Parry, G.; Soo, W.J.; Bissell, M.J. (Univ. of California, Berkeley). Contract W-7405-ENG-48. *Journal of Biological Chemistry, The ;* **254**: No. 23, 11763-11766(Dec 1979).

The regulation of fibronectin and procollagen synthesis has been investigated in normal and Rous sarcoma virus transformed primary avian tendon cells. These two proteins interact at the cell periphery and both are reportedly lost upon transformation. Whether their synthesis was coordinately regulated in Rous sarcoma virus-infected cells was thus examined. It was found that while the synthesis of both pro α_1 and pro α_2 peptides was reduced upon transformation, the synthesis of fibronectin was not altered. Nevertheless, long term radiolabeling demonstrated that fibronectin levels were reduced in transformed cells. It is concluded that the reduction in levels of these components at the surface is brought about by different mechanisms; collagen levels being regulated by procollagen synthesis and fibronectin levels by degradation and/or release into the culture medium. The possibility is discussed that fibronectin is lost from the cell periphery of primary avian tendon cells as a consequence of decreased levels of anchoring collagen molecules.

19253 Steric disposition of O_2 in oxyhemoglobin as revealed by its resonance Raman spectrum. Duff, L.L. (Northwestern Univ., Evanston, IL); Appelman, E.H.; Shriver, D.F.; Klotz, I.M. *Biochemical and Biophysical Research Communications ;* **90**: No. 4, 1098-1103(29 Oct 1979).

Resonance Raman investigations of the Fe-O_2 stretching frequency in oxyhemoglobin containing isotopically unsymmetric ^{16}O-^{18}O point to an end-on geometry, rather than a side-on one.

19254 Observation of a triplet state in chlorophyll protein 668 via optically detected magnetic resonance. Clarke, R.H. (Boston Univ., MA); Leenstra, W.R.; Hagar, W.G. *FEBS (Federation of European Biochemical Societies) Letters ;* **99**: No. 1, 207-209(Mar 1979).

The photo-excited triplet state properties have been investigated of a species contained in the watersoluble chlorophyll protein (Cp 668) extracted from the stems of young plants of Atriplex hotensis using optically detected magnetic resonance (ODMR). The main absorption band of the material occurs at 668 nm with additional regions of absorption to the blue. Upon illumination in the presence of an electron acceptor such as oxygen, a new absorption band appears at 743 nm, while the A_{668} peak decreases in intensity. The fully converted state, Cp 743, is never observed in intact plants, or in plant extracts, so its photoconversion does not seem to be the primary function of this unique water-soluble chlorophyll

protein. In an effort to understand the photoreactive state of Cp 668 and the involvement of triplet states in chlorophyll proteins the following study was undertaken from which are presented the first ODMR results. Some preliminary triplet state data for Cp 668 have been presented.

19255 **Effect of temperature upon the circular dichroism of bradykinin.** Cann, J.R. (Univ. of Colorado Medical Center, Denver); London, R.E.; Stewart, J.M.; Matwiyoff, N.A. *International Journal of Peptide and Protein Research ;* **14**: 388-392(1979).

Analysis of the effect of temperature on the circular dichroism spectrum of bradykinin has led to a more precise understanding of the solution conformation of the peptide. Circular dichroism and ^{13}C nmr have been used in a complementary fashion to support the picture that bradykinin spends a maximum of about 20% of its time in a partially ordered conformation featuring a γ-turn with Pro^7 as the second residue. Since the γ-turn probability is insensitive to temperature, some other conformational effect dominated by the structure of water presumably produces the pronounced change in the circular dichroism spectrum with increasing temperature.

19256 **Agonist-induced affinity alterations of a central nervous system α-bungarotoxin receptor.** Lukas, R.J.; Bennett, E.L. (Univ. of California, Berkeley). Contract W-7405-ENG-48. *Journal of Neurochemistry ;* **33**: 1151-1157(1979).

The ability of cholinergic agonists to block the specific interaction of α-bungarotoxin (α-Bgt) with membrane-bound sites derived from rat brain is enhanced when membranes are preincubated with agonist. Thus, pretreatment of α-Bgt receptors with agonist (but not antagonist) causes transformation of sites to a high-affinity form toward agonist. This change in receptor state occurs with a half-time on the order of minutes, and is fully reversible on dilution of agonist. The results are consistent with the identity of α-Bgt binding sites as true central nicotinic acetylcholine receptors. Furthermore, this agonist-induced alteration in receptor state may represent an in vitro correlate of physiological desensitization. As determined from the effects of agonist on toxin binding isotherms, and on the rate of toxin binding to specific sites, agonist inhibition of toxin binding to the high-affinity state is non-competitive. This result suggests that there may exist discrete toxin-binding and agonist-binding sites on central toxin receptors.

19257 **Application of doubly decoupled ^{13}C [^1H,^{14}N]NMR spectroscopy to studies of the conformation and dynamics of the choline headgroup of phospholipids.** London, R.E. (Los Alamos Scientific Lab., NM); Walker, T.E.; Wilson, D.M.; Matwiyoff, N.A. *Chemistry and Physics of Lipids ;* **25**: 7-14(1979).

The high symmetry about the choline nitrogen atom leads to resolvable scalar ^{13}C-^{14}N coupling in the ^{13}C NMR spectrum of choline. For membranes or model membrane systems containing phosphatidyl choline molecules, this coupling can be partially or completely collapsed due to the slower motion and consequently shorter ^{14}N spin lattice relaxation time of the choline nitrogen. In the present study, this effect has been probed by comparison of the ^{13}C NMR spectra obtained using conventional proton decoupling with spectra obtained using simultaneous ^{14}N and ^1H decoupling, i.e., ^{13}C[^1H,^{14}N]NMR spectroscopy. The results indicate a partially collapsed triplet structure for the choline methyl resonances in several sonicated lipid vesicles as well as in whole Chinese Hamster Ovary cells labeled with a 3 : 3 : 1 mixture of [1-^{13}C]-, [2-^{13}C]-, and [$^{13}CH_3$]choline. Further, the sharpening of the choline C-2 resonance resulting from the ^{14}N decoupling makes possible the observation of three bond ^{13}C-^{31}P scalar coupling and, consequently, a conformational analysis of the rotational isomerism about the choline O-C-1 bond.

19258 **Photosynthetic preparation and characterization of ^{13}C-labeled carbohydrates in Agmenellum quadruplicatum.** Kollman, V.H.; Hanners, J.L.; London, R.E.; Adame, E.G.; Walker, T.E. (Los Alamos Scientific Lab., NM). *Carbohydrate Research ;* **73**: 193-202(1979).

The blue-green alga Agmenellum quadruplicatum (strain PR6) has been used to prepare photobiosynthetically ^{13}C-labeled D-glucose 2-0-(α-D-glucopyranosyl)-glyceric acid (glucosylglycerate), 2-hydroxy-1-(hydroxymethyl)ethyl α-D-glucopyranoside (glucosylglycerol), and α-D-glucopyranosylβ-D-fructofuranoside (sucrose). When grown to a cell density of 4.4 gL^{-1} (dry weight) under nitrate-nitrogen limiting growth conditions for 120 H, the algal cells contained 38% of the dry-cell weight as (1→4)-α-D-glucan (amylose). About 1% of the dry-cell weight was glucosylglycerol, glucosylglycerate, and sucrose. Glutamate was obtained, together with carbohydrates of low molecular weight, when the cells were extracted with chloroform-methanol; D-glucose was recovered from the extracted cells by acid hydrolysis of the starch. The algae were grown by using 20 mol% [^{13}C] carbon dioxide for preparation of labeled carbohydrates and for cellular component identification by whole-cell nmr spectroscopy.

19259 **Calculation of the number of IgG molecules required per cell to fix complement.** Perelson, A.S.; Wiegel, F.W. (Los Alamos Scientific Lab., NM). *Journal of Theoretical Biology ;* **79**: 317-332(1979).

Two molecules of IgG need to be in close proximity upon a cell surface in order to bind complement. Approximate results are obtained here for the probability that two or more IgG molecules are closer than some minimum separation distance, given that N IgG molecules are bound to the cell. Determining this probablity exactly is a classical unsolved problem in geometrical probability. The probability is also estimated of having n pairs of IgG molecules in close proximity and the expected number of IgG pairs is computed. Theoretical results are compared with experimental measurements on complement fixation by IgG.

19260 **Bone mineral solubility and its alteration by 1,25-dihydroxyvitamin D_3.** Brommage, R.; Neuman, W.F. (Univ. of Rochester Medical Center, NY). pp 369-372 of Vitamin D: basic research and its clinical application. Norman, A.W.; Schaefer, K.; Herrath, D.v.; Grigoleit, H.G.; Coburn, J.W.; DeLuca, H.F.; Mawar, E.B.; Suda, T. (eds.). New York, NY; Walter de Gruyter (1979).

From 4. workshop on vitamin D; Berlin, Germany (Feb 1979).

This report describes experiments undertaken to explore the solubilizer theory by characterizing the solubility of bone mineral under less harsh conditions than previously used and determining whether this solubility is altered by 1,25-$(OH)_2D_3$ treatment. Neonatal mouse calvaria were incubated in 3/4 ml of a pH 7.4 buffer containing 90 mM NaCl, 5 mM KCl, 25 mM $NaHCO_3$, 0.5 mM $MgSO_4$, 25 mM HEPES, antibiotics and varying concentrations of Ca and P/sub i/. The incubations were performed at 37°C under a H_2O-saturated atmosphere of 95% air/5% CO_2. Substrates for energy production were omitted in order that cellular metabolism would not interfere with the determination of bone mineral solubility. Preliminary experiments showed that an additional freezing and thawing of the calvaria 3X did not appreciably influence the results and lactate production in the absence of buffer glucose was negligible.

19261 **Membrane potentials and sugar transport by ATP-depleted intestinal cells: effect of anion gradients.** Carter-su, C.; Kimmich, G.A. (Univ. of Rochester Medical Center, NY). *American Journal of Physiology ;* **6**: No. 1, C64-C74(1979).

Rotenone or dinitrophenol treatment was used to decrease cellular ATP levels in isolated chicken intestinal epithelial cells by over 90% and to produce a cell population in which no steady-state accumulation of 3-O-methylglucose (3-OMG) against a concentration gradient is observed. The degree of maximal 3-OMG accumulation and initial influx stimulation in the presence of a given anion or combined Na-anion gradient can be correlated with the magnitude of the diffusion potential as determined by the membrane permeability of the given anion ($SCN^- > Cl^- >$ isethionate$^- > SO_4^{2-}$). 3-OMG influx in the presence of a large NaCl gradient is comparable in ATP-depleted and normally energized cells. The slight difference in influx (energized > ATP depleted) is diminished by ouabain, suggesting that energized cells maintain a large membrane potential than the ATP-depleted cells. Although initial rates of 3-OMG uptake into Na^+-depleted normally energized cells also varies with the anion gradient, these differences disappear with time of incubation in Na^+ or when cells are preincubated in Na^+. In

this situation, function of a rheogenic Na^+ pump can establish a membrane potential in contrast to the case with ATP-depleted cells, which have a potential only as long as imposed ion gradients are maintained. All these experiments point to an important role for the electrical membrane potential as a driving force for Na^+-dependent solute transport systems in both ATP-depleted and normally energized cells.

19262 Energetics of sugar transport by isolated intestinal epithelial cells: effects of cytochalasin B. Kimmich, G.A.; Randles, J. (Univ. of Rochester Medical Center, NY). *American Journal of Physiology ;* **6**: No. 1, C56-C63(1979).

The capability of isolated intestinal epithelial cells to establish concentration gradients of 3-O-methylglucose (3-OMG) by a Na^+-dependent transport system is limited by concomitant function of a Na^+-independent, facilitated diffusion transport system. Monosaccharides accumulated by the active system are continuously lost via the passive system, which acts to lower steady-state sugar gradients maintained by the cell. Cytochalasin B is a potent inhibitor of the passive system and allows the cells to establish a sugar gradient that is much higher than normal. When extracellular (3-OMG) is 1 mM, cytochalasin induces sugar accumulation ratios of 30-fold (+- phlorizin) in contrast to control ratios of approximately 10-fold. When (3-OMG) is 0.1 mM, cytochalasin (0.1 mM) induces 40-fold accumulation ratios. When changes in extracellular sugar concentration are considered, steady-state concentration gradients observed are 70-fold. For a Na:sugar coupling stoichiometry of 1:1, gradients of this magnitude represent the approximate theoretical maximum for a transport system driven exclusively by the transmembrane electrochemical potential for Na^+.

5503 Cytology

REFER ALSO TO CITATION(S) 19252, 19261, 19262, 19271, 19273, 19315, 19344

19263 (LMF—84, pp 443-445) **Isolation and culturing of lung Type II epithelial cells.** Li, A.P. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

A population of lung cells was isolated and cultured from a Fischer-344 rat. The cells had an epithelial morphology. Using scanning electron microscopy, the cells were shown to be squamated, with a smooth cell surface. Transmission electron microscopy demonstrated the presence of lamellar-inclusion bodies, desmosomes, and high synthetic and secretory activities. These cells will be used for the development of an in vitro assay for the detection of genotoxicants.

19264 Functional capabilities of marmoset T and B lymphocytes in primary in vitro antibody formation. Nickerson, D.A.; Gengozian, N. (Oak Ridge Associated Universities, TN). Contract AC05-76OR00033. *Cellular Immunology ;* **57**: No. 2, 408-419(15 Jan 1981).

In vitro tests of T- and B-lymphocyte function of two marmoset species, Saguinus fuscicollis and Saguinus oedipus, were examined to explore the lower immune response profile previously reported for S. o. oedipus. Experiments with trinitrophenyl-lipopolysaccharide (TNP-LPS) revealed peripheral blood leukocytes (PBL) from both species capable of antibody formation. This response was both T cell and monocyte independent; indeed, removal of T cells led to an enhanced response, indicating a regulatory role for this cell in each species. Studies with the nonmitogenic form of TNP-LPS, trinitrophenyl-base-hydrolyzed-lipopolysaccharide, revealed that plaque-forming cells could be obtained from S. fuscicollis PBL while S. o. oedipus PBL were unresponsive. This report also demonstrates that hemopoietic chimerism, a feature common to all marmosets, has a negative influence on antibody-forming capabilities.

5504 Genetics

REFER ALSO TO CITATION(S) 19249

19265 (UCRL—85849) Sister chromatid exchange, DNA repair, and single-gene mutation. Carrano, A.V.; Thompson, L.H. (Lawrence Livermore National Lab., CA (USA)). 13 Apr 1981. Contract W-7405-ENG-48. 22p. (CONF-810247—1). NTIS, PC A02/MF A01.

From ICN-UCLA symposia on mechanisms in chemical carcinogenesis; Keystone, CO, USA (22 Feb 1981).

Sister chromatid exchange (SCE) has been studied in cultured mammalian cells with regard to the nature of the inducing lesion, mutation induction, and factors that modify the observed frequency following mutagen exposure. SCEs can be induced by a wide spectrum of DNA lesions and, for nine agents examined, the frequency of induced SCE is linearly related to induced single-gene mutation. Further, a deficiency in DNA repair may alter the expression of both SCE and mutation in a qualitatively similar manner. The frequency of SCE induced by mitomycin-C is suppressed in heterochromatin relative to euchromatin and, in non-dividing lymphocytes, the lesions leading to the formation of SCEs may persist for several months.

19266 Normal tRNAs promote ribosomal frameshifting. Atkins, J.F. (Cold Spring Harbor Lab., NY); Gesteland, R.F.; Reid, B.R.; Anderson, C.W. *Cell ;* **18**: 1119-1131(Dec 1979).

The addition of SER/sup AGU//sub AGC/ tRNA to an E. coli cell-free protein synthesizing system which contains the endogenous tRNA levels results in up to 100% of the ribosomes translating the MS2 coat gene shifting into the -1 reading frame. An analogous phenomenon is seen at a much lower level without the tRNA addition, where a shift into the +1 frame can also be detected. Thus translation with the endogenous tRNA levels yields proteins which have the amino terminus of the coat protein but which are substantially larger than the coat protein and comprise about 5% of the coat translation. Since the lysis gene overlaps the 3′ end of the coat gene in the +1 frame, it is concluded that the reading frame shift into the +1 frame yields a hybrid protein. Also, evidence is presented that ribosomes translating the synthetase gene shift into the -1 frame near the distal end of the gene. This frameshifting is promoted by thr/sup ACU//sub ACC/ tRNA. Specific competitor tRNAs for both Thr and Ser tRNA-promoted frameshifting have been characterized. The generality of this new mechanism for producing additional proteins is unclear, but its investigation should increase understanding of the coding mechanism and its origin.

5505 Metabolism

REFER ALSO TO CITATION(S) 19250, 19261, 19262

5506 Medicine

19267 (LMF—84, pp 364-366) **State space analysis of forced oscillation measurements of respiratory system impedance.** Johnson, W.K.; Mauderly, J.L. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The mechanical characteristics of the respiratory system were modeled so that the effects of disease processes on respiratory syste impedance could be studied. Model analysis indicated that the pattern of respiratory system impedance as a function of oscillating frequency and breathing pattern flow and volume contained sufficient information to detect and identify diseases which alter the mechanical properties of major respiratory system components. An impedance measurement and analysis system was designed and constructed to test these predictions. Measurements of dogs with histamine-induced small airway constriction verified the impedance pattern changes predicted by the model.

19268 **Emission computed tomography.** Budinger, T.F.; Gullberg, G.T.; Huesman, R.H. pp 147-246 of Image reconstruction from projections. Implementaton and applications. Herman, G.T. (ed.). New York, NY; Springer-Verlag (1979).

This chapter is devoted to the methods of computer assisted tomography for determination of the three-dimensional distribution of gamma-emitting radionuclides in the human body. The major applications of emission computed tomography are in biological research and medical diagnostic procedures. The objectives of these procedures are to make quantitative measurements of in vivo biochemical and hemodynamic functions.

5507 Microbiology

REFER ALSO TO CITATION(S) 18262, 18298, 18299, 19252, 19258, 19266, 19322

5508 Morphology

REFER ALSO TO CITATION(S) 19263

5509 Pathology

REFER ALSO TO CITATION(S) 19267, 19347, 19359, 19362

19269 (LMF—84, pp 357-360) **Effects of elastase-induced lung disease on the forced expirogram of the rat.** Mauderly, J.L. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Forced expiratory tests were performed on rats using a range of lung inflation pressures to simulate tests proven sensitive to certain small airway diseases in man. These tests and other respiratory function evaluations were used to detect changes in lungs of rats treated with elastase to induce emphysematous lung disease. Forced expiratory parameters were more sensitive to the induced disease than most function tests. Expirations from 100%, 86%, and 62% of maximal lung volume were all sensitive to the disease, but there were indications that sensitivity was improved at lower lung volumes.

19270 (LMF—84, pp 367-370) **Effect of repeated lavage on airway fluids of Syrian hamsters.** Henderson, R.F.; Chavez, G.T. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Serial pulmonary lavage of Syrian hamsters on a daily or weekly basis produced an inflammatory response in the lung. The inflammatory response was much greater in the hamsters lavaged daily than in those lavaged weekly. This response precludes the use of frequent serial lavages of hamsters in vivo as a probe for detection of developing lung pathology. Serial segmental lung washings in larger animals at less frequent intervals might prove to be a more useful tool for serial probing for lung injury than the total lung lavage used in rodents.

5510 Physiological Systems

REFER ALSO TO CITATION(S) 19256, 19260, 19267, 19268, 19269, 19341, 19343, 19344, 19347, 19361, 19366, 19369

19271 (LMF—84, pp 165-168) **Recruitment of immune cells to the lung.** Bice, D.E.; Degen, M.; Harris, D.L.; Muggenburg, B.A. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The deposition of antigen into the dog lung induces a large accumulation of antibody-forming cells. The present study was designed to differentiate between two possible mechanisms for this result. Dogs were immunized in the left and right cardiac lung lobes with antigenically different particulate antigens. The number of lymphoid cells producing antibodies to each antigen was measured in both immunized lung lobes. Similar numbers of antibody-forming cells for each antigen were found in each immunized lung lobe. These results indicated that increased vascular permeability, rather than antigen retention, is responsible for the recruitment of immune cells from the blood into the immunized lung lobes.

19272 (LMF—84, pp 348-352) **Lymphatic drainage to individual thoracic lymph nodes in the rat.** Harris, D.L.; Bice, D.E. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

To assess the immune response in seven individual thoracic lymph nodes, groups of 5 Fischer-344 rats were sacrificed at 6 days after intraperitoneal immunization with 10^8 sheep red blood cells (SRBC) and at 7 days after intratracheal immunization with 10^8 SRBC. Lymph nodes were pooled within the groups of rats according to anatomical location and assayed for the presence of IgM and IgG antibody-forming cells. The results show that one lymph node drains both the lungs and the peritoneal cavity, while the other lymph nodes appear to be specific for either the lung or the peritoneal cavity.

19273 (LMF—84, pp 353-356) **Lung cell proliferation with granulomatous pneumonia in rats.** Felicetti, S.A.; Brooks, A.L.; Hackett, N.A. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The uptake of ^{3}H-thymidine by cells in lung parenchyma and in granulomas after intratracheal instillation of Bacillus Calmette Guerin (BCG) was studied in sensitized and unsensitized rats. The BCG initiated an immediate diffuse alveolitis and the formation of allergic granulomas. In the sensitized animals, the inflammation induced was more intense and of longer duration, and granulomas were formed earlier. ^{3}H-thymidine uptake tended to be higher in the sensitized animals in parenchymal type II epithelial cells, mononuclear cells in the alveolar septa, endothelial cells and alveolar macrophages. The peak labeling indices of inflammatory macrophages were also higher in sensitized than in unsensitized animals.

5520 Public Health

REFER ALSO TO CITATION(S) 19247, 19321, 19336, 19338

5530 Agriculture And Food Technology

REFER ALSO TO CITATION(S) 18263, 19250

56 BIOMEDICAL SCIENCES, APPLIED STUDIES

5601 Radiation Effects

REFER ALSO TO CITATION(S) 18118, 19145, 19146, 19148, 19149, 19150, 19243, 19320, 19369, 19505, 19590

19274 **Role of bone marrow cells in the growth inhibition of transplanted methylcholanthrene-induced sarcoma (MCA).** Scuderi, P.; Rosse, C. (Univ. of Washington, Seattle). Contract EY-76-S-06-2225. *Transplantation Society, International Congress, Proceedings ;* **13**: No. 1, 747-751(Mar 1981).

From 8. international congress of the Transplantation Society; Boston, MA, USA (29 Jun 1980).

The operation of various antitumor mechanisms in vivo remains largely unknown. The presence of specific sensitized cells in the spleen and lymph node of tumor-bearing and tumor-immune animals has been demonstrated. Such cells are more effectively revealed by secondary sensitization of the splenocytes of tumor-immune animals in vitro by reexposing them to the tumor. Tumor-immune in vitro sensitized splenocytes (ISS) are highly effective in retarding the in vivo growth of the sensitizing tumor when they are transplated together with tumor cells into normal recipient mice. However, if the same cell transfer is made into lethally irradiated

mice, the tumor will grow rapidly in 100% of recipients. The objective of the present study is to explore this phenomenon and to determine the origin of the host cells that are capable of collaborating with tumor-immune in vitro sensitized splenocytes in the regulation of tumor growth. We designed experiments to test whether the host cells involved in tumor growth regulation are derived from the spleen, thymus, or the bone marrow and set out to determine whether or not collaboration of the host cells with ISS was specific as far as the sensitizing tumor was concerned.

19275 **(CONF-8004149—) Proceedings of the workshop on radiation treatment of sewage sludge.** Roy, A.N. (comp.). (Bhabha Atomic Research Centre, Bombay (India). Radiation Technology and Industrial Applications Section). 1980. 64p. NTIS (US Sales Only), PC A04/MF A01.

From Workshop on radiation treatment of sewage sludge; Bombay, India (18 Apr 1980).

Seven papers were presented. They are entitled: microbiological aspects of sewage-sludge hygienization by irradiation; development of radiation treatment techniques for sewage sludge in Jamuna River - a strategy for destroying pathogenic organisms; project summary on sludge treatment with radiation; civil engineering aspects about hygienization of sewage sludge by irradiation treatment; mechanical engineering aspects of sludge hygienization irradiator; electrical controls aspects of sewage sludge irradiator; radiological safety. (JGB)

19276 **(DOE/EP—0001) Investigation of the radiological safety concerns and medical history of the late Joseph T. Harding, former employee of the Paducah Gaseous Diffusion Plant.** Vallario, E.J.; Wolfe, H.R. (USDOE Assistant Secretary for Environmental Protection, Safety and Emergency Preparedness, Washington, DC). Mar 1981. 137p. NTIS, PC A07/MF A01.

An ex-employee's claims that inadequate enforcement of radiation safety regulations allowed excess radiation exposure thereby causing his deteriorating health was not substantiated by a thorough investigation. (PSB)

19277 (DOE/EV/04326—3, pp I.1-I.20) **Estimation of the skeletal burden of bone-seeking radionuclides from in vivo scintillation measurements of their content in the skull: contribution from radionuclides in the thoracic skeleton to in vivo measurement of activity in the lung.** 1980. NTIS, PC A08/MF A01.

In In vivo measurements of bone-seeking radionuclides. Progress report, 1977-1980.

After the initiation of NaI(Tl), spectrometric methods for detecting photon-emitting radionuclides in man, it became evident that the high background rates in the low energy regions precluded in vivo measurement of many bone-seeking nuclides. To meet these needs a dual crystal, low energy sensitive NaI(Tl)-CsI(Tl) detector system was developed. To date this system, in combination with more routine bioassays, remains the optimum methodology for the determination of internal exposure to low energy, photon-emitting radionuclides. Since most occupational exposures occur by inhalation, internal deposits must be quantitated with these detectors placed over the lung area. Since many of the alpha-emitting nuclides are bone-seekers, the contribution of material which has been transported from the lung and deposited in the skeleton must be accounted for. (KRM)

19278 (DOE/EV/04326—3, pp VI.1-VI.27) **In vivo measurements of exposed individuals.** 1980. NTIS, PC A08/MF A01.

In In vivo measurements of bone-seeking radionuclides. Progress report, 1977-1980.

This section describes several studies of exposed individuals and the actual in vivo measurements made at this laboratory during the past three years. In all cases, the nuclides being measured are bone seekers and were measured with NaI(Tl)-CsI(Tl) detectors above the thorax or surrounding the head. The studies include the measurement of occupational contamination for ^{241}Am, metabolic studies of ^{241}Am in a child and his father, estimation of employee exposures to compounds of depleted uranium, measurements of residents of the Marshall Islands and measurement of occupational contamination for lead (Pb-210). (KRM)

19279 (LMF—84, pp 107-110) **Influence of radiation dose patterns on lung tumor incidence in dogs that inhaled beta emitters.** Hahn, F.F.; Boecker, B.B.; Cuddihy, R.G.; Hobbs, C.H.; McClellan, R.O.; Snipes, M.B. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The radiation dose pattern after inhalation of beta emitting radionuclides influences the resulting biological effects. In previous studies, groups of beagle dogs were exposed to aersols of ^{90}Y, ^{91}Y, ^{144}Ce or ^{90}Sr in relatively insoluble particles. The effective half-times of these four radionuclides in the lung ranged from 2.5 to 400 days. The range of initial lung burdens of radionuclides was selected to produce early deaths at the highest levels and no anticipated effects at the lowest levels over their life span. At 7 years or more after exposure, thirty-four pulmonary carcinomas and thirty pulmonary sarcomas have been observed. The number of tumors per rad was determined in each of the studies and indicates that the radiation dose pattern influences the tumor incidence per rad. The more protracted dose delivered by ^{90}Sr was more effective in producing tumors by a factor of 2.5 during the first 7 years after exposure. This result is based on the assumption of a linear, nonthreshold dose-response.

19280 **(LMF—84) Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.** Diel, J.H.; Bice, D.E.; Martinez, B.S. (eds.). (Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (USA)). Dec 1980. Contract AC04-76EV01013. 628p. NTIS, PC A99/MF A01.

Separate abstracts were prepared for each of the 109 papers presented in this progress report. (ERB)

19281 (LMF—84, pp 13-16) **Intralung distribution and dose pattern of $^{238}PuO_2$ aerosol particles inhaled by Syrian hamsters.** Diel, J.H.; Mewhinney, J.A.; Snipes, M.B. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Syrian hamsters were exposed by inhalation to a monodisperse aerosol of $^{238}PuO_2$. The distribution of particles and the resulting dose pattern in their lungs were studied as a function of time after exposure. The particles deposited preferentially in the central regions of the lung, moved toward the periphery at early times and then were cleared from all regions with about equal efficiency. The dose within regions of the lung containing airways was found to be no higher than the dose in other regions of the lung.

19282 (LMF—84, pp 17-19) **Breakup of inhaled $^{238}PuO_2$ particles in the lungs of hamsters and dogs.** Diel, J.H.; Mewhinney, J.A. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Beagle dogs and Syrian hamsters were exposed by inhalation to monodisperse aerosols of $^{238}PuO_2$. Fragmentation of particles in lung was observed autoradiographically in both species. A simple mathematical model fitted to the fragmentation and lung retention data for dogs suggested that fragmentation caused 33% of the clearance of these particles up to 730 days after exposure.

19283 (LMF—84, pp 20-24) **Radiation dose patterns in beagle dogs following inhalation of monodisperse and polydisperse aerosols of $^{238}PuO_2$.** Mewhinney, J.A.; Diel, J.H. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The radiation dose pattern to beagle dogs after inhalation of monodisperse or polydisperse aerosols of $^{238}PuO_2$ is being measured. Analysis of excreta samples and tissue samples is complete for all animals through 2 years after inhalation. Retention in lung, liver and skeleton were described by functions incorporating particle fragmentation to provide a continuous fit to the data. Radiation dose delivered to lung was approximately one-half the value calculated from the ICRP30 model. For liver and skeleton, the radiation dose was a factor of 5 higher than the value calculated using the ICRP30 model.

19284 (LMF—84, pp 25-28) **Disposition of inhaled $^{239}PuO_2$ in dogs.** Guilmette, R.A.; Diel, J.H.; Muggenburg, B.A.; Mewhinney, J.A. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The temporal pattern of radiation dose to tissues of beagle dogs which have inhaled $^{239}PuO_2$ aerosols is being studied. Dogs received single inhalation exposures to monodisperse or polydisperse aerosols. Sacrifice of male and female pairs of dogs are being performed from 4 hours to 8 years after exposure. Radiochemical analysis of Pu in dog tissues and urine and feces samples are used to measure the temporal behavior of inhaled $^{239}PuO_2$. The data to two years after exposure reaffirm the insoluble nature of $^{239}PuO_2$ in vivo; less than two percent of the amount of Pu initially deposited in lung has been found in tissues other than lung and thoracic lymph nodes. The rate of accumulation of Pu in the tracheobronchial lymph nodes has decreased considerably during the second year after exposure.

19285 (LMF—84, pp 29-33) **Patterns of dose after inhalation of monodisperse or polydisperse aerosols of $^{241}AmO_2$ by beagle dogs.** Mewhinney, J.A. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Beagle dogs received a single inhalation exposure to a monodisperse or a polydisperse aerosol of $^{241}AmO_2$ and the resultant patterns of radiation dose were measured. Three monodisperse aerosol sizes and one polydisperse aerosol were used to assess the role of particle size on the in vivo solubility of $^{241}AmO_2$ in lung and the translocation of solubilized material to other tissues. To date, dogs have been sacrificed at up to 6 years after inhalation exposure. The pulmonary retention and translocation of ^{241}Am to other tissues such as liver and skeleton are not adequately described by the current model given by the ICRP.

19286 (LMF—84, pp 34-36) **Dose patterns of inhaled pure and mixed U and Pu oxide aerosols in rats.** Kanapilly, G.M.; Boecker, B.B. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Inhalation studies in rats were conducted with pure $^{239}PuO_2$, $^{233}UO_2$ and five solid solutions of $(Pu\text{-}U)O_2$, ranging from 0.9 to 35 %Pu. The data presented here on animals sacrificed at 2 hours, 4 or 32 day postexposure show that the aerosols were relatively insoluble. This observation was somewhat different from what was expected from in vitro dissolution studies. Additional data from animals sacrificed at later times after exposure will be necessary to provide confirmation.

19287 (LMF—84, pp 37-40) **Comparison of ICRP30 dosimetry model for uranium and thorium with alternative dosimetry models.** Griffith, W.C.; Cuddihy, R.G.; Hoover, M.D. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

In this simulation study, the effect of the assumptions in the ICRP30 model that (1) activity from the lung and pulmonary lymph nodes are summed to calculate the radiation dose to the lung and (2) that the radioactive progeny in a decay chain are retained in the organs with the retention parameters of the ancestoral parent are examined for class Y aerosols of radionuclides of uranium and thorium. The results of the study indicate that the first assumption overestimates the dose to the lung by a factor of 2 or less for most radionuclides but can overestimate it by as much as a factor of 10 for ^{232}Th. The second assumption may overestimate or underestimate the doses to internal organs by as much as a factor of 50 but it has no substantial effect on annual limits of intake.

19288 (LMF—84, pp 43-47) **Toxicity studies of inhaled beta-emitting radionuclides: status report.** Hahn, F.F.; McClellan, R.O. Boecker, B.B. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The influence of total dose and dose rate on the effects of inhaled beta-emitting radionuclides is being studied in laboratory animals. The aerosol forms inhaled are either relatively soluble ($^{90}SrCl_2$, $^{144}CeCl_3$ $^{91}YCl_3$ or $^{137}CsCl$) or relatively insoluble (^{90}Y, ^{91}Y, ^{144}Ce or ^{90}Sr in fused aluminosilicate particles). Initial lung or whole-body radionuclide burdens were selected to result in early deaths due to severe lesions at the highest exposure levels and more subtle changes, such as neoplasia, at the lower levels. The organs affected depend on the solubility and chemical characteristics of the isotope. Studies with young adult dogs are complemented with comparable studies in other species (mice, rats and Syrian hamsters) and with animals of different ages (immature, aged).

19289 (LMF—84, pp 48-52) **Toxicity of inhaled $^{90}SrCl_2$ in beagle dogs.** Snipes, M.B.; Muggenburg, B.A.; Hahn, F.F.; Boecker, B.B.; Jones, R.K.; McClellan, R.O.; Pickrell, J.A. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Beagle dogs were exposed to aerosols containing ^{90}Sr resulting in initial body burdens ranging from 2.5 to 250 μCi ^{90}Sr/kg body weight. These dogs were maintained for lifetime observation or assigned to a sacrifice schedule. Dogs have died from a variety of causes related to radiation exposure, including bone marrow aplasia and bone-related neoplasms. During the past few years, most deaths have been due to problems associated with aging, such as renal insufficiency and a variety of tumors in organs receiving low doses of radiation relative to the skeleton, which is the primary target of radiation exposure for internally deposited ^{90}Sr. The five dogs remaining in this study will be observed for the remainder of their life spans.

19290 (LMF—84, pp 53-56) **Toxicity of inhaled $^{91}YCl_3$ in beagle dogs.** Hahn, F.F.; Muggenburg, B.A.; Boecker, B.B.; Jones, R.K.; McClellan, R.O.; Pickrell, J.A. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The metabolism, dosimetry and effects of inhaled $^{91}YCl_3$ in beagle dogs are being studied. Forty-two dogs with ^{91}Y initial body burdens from 14 to 1300 μCi/kg body weight and 12 control dogs are being maintained for lifetime observation. Four additional dogs with a mean initial body burden of 180 μCi/kg body weight were placed in a sacrifice study. Thirty-six of the exposed dogs and 7 of the control dogs have died. Dogs with the highest activity levels died with bone marrow damage and pancytopenia. Three dogs died with nasal cavity carcinomas and three with pulmonary carcinomas and one with hepatic hemangiosarcoma that all appear related to radiation injury. Control dogs died of miscellaneous neoplastic and chronic diseases. Observations are continuing on 10 surviving exposed dogs and six surviving unexposed dogs.

19291 (LMF—84, pp 57-61) **Toxicity of inhaled $^{144}CeCl_3$ in beagle dogs.** Muggenburg, B.A.; Hahn, F.F.; Boecker, B.B.; McClellan, R.O.; Pickrell, J.A. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The metabolism, dosimetry and effects of inhaled $^{144}CeCl_3$ in beagle dogs are being studied to assess the biological consequences of inhaling ^{144}Ce. Studies have shown that the ^{144}Ce deposited in the lung as $^{144}CeCl_3$ is translocated at a moderately rapid rate to liver and skeleton and that significant radiation doses are accumulated by all three organs. Fifty-five dogs that inhaled $^{144}CeCl_3$ and 17 control dogs are being observed for their life span. The ^{144}Ce-exposed dogs had long-term retained burdens that ranged from 2.6 to 360 μCi ^{144}Ce/kg body weight. Fifty-three of the dogs exposed to $^{144}CeCl_3$ have died and twelve control dogs have died. Serial observations are continuing on the two surviving exposed dogs and five control dogs.

19292 (LMF—84, pp 63-66) **Toxicity of injected $^{137}CsCl$ in beagle dogs.** Muggenburg, B.A.; Hahn, F.F.; Boecker, B.B.; Jones, R.K.; McClellan, R.O.; Pickrell, J.A.; Redman, H.C. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Studies of the metabolism, dosimetry and effects of intravenously administered $^{137}CsCl$ in the beagle dog are being conducted

to aid in assessing the biologic consequences of exposure to ^{137}Cs that might occur in the event of certain nuclear accidents. Effects of the chronic, relatively uniform whole-body exposures produced by ^{137}Cs are being compared with other diverse radiation dose patterns resulting from inhalation of radioactive aerosols. Fifty-four dogs that were injected with $^{137}CsCl$ and 12 control dogs are being observed for their life spans. Thirty-four of the dogs injected with $^{137}CsCl$ have died: 11 of hematologic dyscrasias, 13 of neoplastic diseases and 10 from other diseases. Five control dogs have died; one from a neoplastic disease and four from other diseases. Serial observations are continuing on the surviving 20 $^{137}CsCl$ injected dogs and seven control dogs.

19293 (LMF—84, pp 67-70) **Toxicity of ^{90}Y inhaled in a relatively insoluble form by beagle dogs.** Hahn, F.F.; Hobbs, C.H.; McClellan, R.O.; Mauderly, J.L.; Pickrell, J.A. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The metabolism, dosimetry and biologic effects of inhaled ^{90}Y in fused aluminosilicate particles in beagle dogs are being studied. Eighty-nine dogs with initial lung burdens ranging from 80 to 5200 μCi/kg body weight and 12 control dogs are being maintained for life span observations. The doses achieved, short half-life and relative insolubility of the ^{90}Y in this vector resulted in a relatively high, but rapidly decreasing radiation dose rate to the lung. To date, 51 exposed dogs have died; 38 from radiation pneumonitis, five with pulmonary neoplasms and eight from other causes. Thirty-eight surviving exposed and 12 control dogs are being studied for their life spans.

19294 (LMF—84, pp 71-75) **Toxicity of ^{91}Y inhaled in a relatively insoluble form by beagle dogs.** Hahn, F.F.; Muggenburg, B.A.; Hobbs, C.H.; McClennan, R.O.; Mauderly, J.L.; Pickrell, J.A. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Beagle dogs were exposed to aerosols of ^{91}Y in fused aluminosilicate particles resulting in initial lung burdens ranging from 11 to 300 μCi ^{91}Y/kg body weight. These dogs were maintained for life span observation or assigned to a sacrifice schedule for study of radiation dose patterns. Dogs with higher lung burdens died at early times with radiation pneumonitis. At later times, tumors were seen in some organs receiving high radiation doses; lung, nasal cavity and heart. No tumors were seen in the tracheobronchial lymph nodes. Observations are continuing on the thirty-one exposed and 11 control dogs that remain alive 9 to 10.5 years after exposure.

19295 (LMF—84, pp 76-81) **Toxicity of ^{144}Ce inhaled in a relatively insoluble form by beagle dogs.** Boecker, B.B.; Hahn, F.F.; Muggenburg, B.A.; Mauderly, J.L.; McClellan, R.O.; Pickrell, J.A. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The metabolism, dosimetry and effects of ^{144}Ce inhaled in fused aluminosilicate particles are being investigated in the beagle dog to assess the long-term biological consequences of release of relatively insoluble aerosol forms of ^{144}Ce that could occur in nuclear accidents. The effects resulting from the relatively protracted radiation dose patterns to the lung from this form of ^{144}Ce are being compared with effects of other radiation dose patterns to the lung. One hundred eleven dogs were exposed to aerosols of ^{144}Ce in fused aluminosilicate particles to yield initial lung burdens of 0.0024 to 210 μCi/kg body weight and 15 control dogs were exposed to nonradioactive fused aluminosilicate particles. To date, 65 ^{144}Ce-exposed and 2 control dogs have died or were euthanized at 143 to 4578 days after inhalation of ^{144}Ce. Prominent findings in the ^{144}Ce-exposed dogs were radiation pneumonitis in 17 dogs that died at early times and neoplastic disease in 39 of the 48 dogs that died 750 days or later. Observations are continuing on the 46 ^{144}Ce-exposed and 13 control dogs remaining alive at this time, at least 3337 days after exposure.

19296 (LMF—84, pp 82-85) **Toxicity of ^{144}Ce inhaled in a relatively insoluble form by immature beagle dogs.** Boecker, B.B.; Merikel, B.S.; Hahn, F.F.; Mauderly, J.L.; McClellan, R.O. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The influence of age at exposure on the resulting patterns of deposition, retention, dosimetry and biological effects from a single inhalation exposure to a relatively insoluble form of a beta-emitting radionuclide with a relatively long physical half-life is being investigated. Immature beagle dogs (3 months of age) were exposed once, by inhalation, to an aerosol of ^{144}Ce incorporated in fused aluminosilicate particles. Forty-nine dogs that received graded initial lung burdens ranging from 0.004 to 140 μCi ^{144}Ce/kg body weight and five control dogs comprise this study. To date, 16 of the ^{144}Ce-exposed dogs and one of the controls have died. Dogs with the highest initial lung burdens of ^{144}Ce died first (during the first 4 months) with radiation pneumonitis, pulmonary fibrosis and congestive heart failure. Pulmonary hemangiosarcoma was the primary finding in dogs that died at 1.5 to 2 years after exposure. Deaths beyond that time have primarily involved extrapulmonary hemangiosarcomas. Observations are continuing on the surviving 33 ^{144}Ce-exposed and four control dogs.

19297 (LMF—84, pp 86-89) **Toxicity of ^{144}Ce inhaled in a relatively insoluble form by aged beagle dogs.** Boecker, B.B.; Hahn, F.F.; Muggenburg, B.A.; Mauderly, J.L.; McClellan, R.O.; Pickrell, J.A. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The toxicity of relatively insoluble ^{144}Ce inhaled by 8- to 10.5-year-old beagle dogs is being investigated to provide information on possible age-related differences in the resulting long-term biological responses. Forty-two dogs were exposed, nose-only, to aerosols of ^{144}Ce in fused aluminosilicate particles to yield initial lung burdens of 2.2 to 75 μCi ^{144}Ce/kg body weight, and 12 control dogs were exposed to nonradioactive fused aluminosilicate particles. To date, 38 ^{144}Ce-exposed dogs and 10 control dogs have died or were euthanized between 197 and 2375 days after inhalation of the ^{144}Ce. Prominent findings in the ^{144}Ce-exposed dogs were radiation pneumonitis in 19 dogs that died during the first 943 days post-exposure and neoplastic disease in seven of the 15 dogs. However, only one of these tumors killed the dog. No hemangiosarcomas have been observed in this study, although they were a prominent finding in immature or young adult dogs exposed to ^{144}Ce. Observations are continuing on the four surviving ^{144}Ce-exposed and two control dogs.

19298 (LMF—84, pp 90-94) **Toxicity of ^{90}Sr inhaled in a relatively insoluble form by beagle dogs.** Snipes, M.B.; Hahn, F.F.; Muggenburg, B.A.; Mauderly, J.L.; McClellan, R.O.; Pickrell, J.A. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Beagle dogs were exposed by inhalation to ^{90}Sr in a relatively insoluble form to study long-term health effects. Lung burdens ranged from 0.12 to 96 μCi of ^{90}Sr per kilogram of body weight. High levels of exposure have caused pulmonary fibrosis and radiation pneumonitis; lower level exposures caused long-term effects which included cancer of the lung, heart and tracheobronchial lymph nodes. Most of these tumors were hemangiosarcomas. Six dogs died during the past year and two of them had hemangiosarcoma primary to a tracheobronchial lymph node. This was a new finding in this study and indicates the importance of considering the radiation dose to thoracic lymph nodes which continually accumulate radioactive particles after inhalation exposure to relatively insoluble radioactive aerosols.

19299 (LMF—84, pp 95-98) **Repeated inhalation exposure of rats to aerosols of $^{144}CeO_2$.** Lundgren, D.L.; Hahn, F.F.; McClellan, R.O. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The effects of protracted beta irradiation of the lungs of rats are being studied. Rats were exposed seven times at 60-day intervals by inhalation to aerosols of $^{144}CeO_2$ to re-establish lung bur-

dens of 0.04, 0.20, 1.0 or 5.0 μCi of ^{144}Ce. These rats are being compared with rats exposed once to $^{144}CeO_2$ to achieve similar initial lung burdens of ^{144}Ce. Repeated exposure to $^{144}CeO_2$ resulted in about a fivefold increase in the radiation doses to the lungs compared with rats exposed once to achieve similar lung burdens of ^{144}Ce.

19300 (LMF—84, pp 99-103) **Biological effects of repeated inhalation exposure of beagle dogs to relatively insoluble aerosols of ^{144}Ce.** Boecker, B.B.; Hahn, F.F.; Muggenburg, B.A.; McClellan, R.O.; Mauderly, J.L.; Pickrell, J.A. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Beagle dogs were exposed repeatedly to a relatively insoluble form of ^{144}Ce (in fused aluminosilicate particles) to study the deposition, retention, and long-term biological effects for comparison with data from dogs that were exposed only once to a similar aerosol. Four groups of nine dogs each were exposed once every 8 weeks for 2 years (13 exposures) to achieve specified exposure goals. These goals were: to increase the lung burden by 2.5 μCi ^{144}Ce/kg body weight with each exposure; to reestablish lung burdens of 9 or 4.5 μCi ^{144}Ce/kg body weight and to expose controls to fused aluminosilicate particles containing nonradioactive cerium. To date, 19 exposed dogs and 2 control dogs have died or were euthanized. The most prevalent findings to date have been pulmonary carcinomas (7 dogs) and hemangiosarcomas in the tracheobronchial lymph nodes (3 dogs). Observations are continuing on the surviving 8 ^{144}Ce-exposed and 7 control dogs who are now at approximately 2500 days (6.8 years) after the first exposure.

19301 (LMF—84, pp 104-106) **Improved hazard-function method of analysis of monotone dose-effect probabilities.** Scott, B.R. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

An improved, nonparametric method for generating monotonically increasing incidence versus dose curves after long-term exposure to a toxic agent is described. The maximum likelihood principle was used to derive appropriate point estimates of the cumulative hazard function and the response probability for an array of doses. As an example of how probability estimates obtained using the improved method differ from those obtained using an earlier method, data for radiation pneumonitis and pulmonary fibrosis caused by long-term exposure of days to ionizing radiation are analyzed.

19302 (LMF—84, pp 113-117) **Toxicity of inhaled alpha-emitting radionuclides: status report.** Muggenburg, B.A.; Mewhinney, J.A.; Hahn, F.F.; Boecker, B.B.; Guilmette, R.A.; Hobbs, C.H.; Mauderly, J.L.; McClellan, R.O.; Lundgren, D.L. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

A series of interrelated dose-response studies in which beagle dogs and rodents are being exposed to aerosols of transuranic alpha-emitting radionuclides is described. Monodisperse aerosols of oxides of ^{239}Pu, ^{238}Pu, ^{241}Am, ^{244}Cm ^{242}Cm are used in studies to measure the relative importance of such as the average organ dose, local dose around particles, specific activity, particle size and number of particles inhaled upon the development of biological effects. The elemental characteristics, chemical form, species of animal and age of the animal at the time of inhalation exposure may also influence the toxicity of these radionuclides and are also being studied.

19303 (LMF—84, pp 118-128) **Toxicity of inhaled $^{238}PuO_2$ in beagle dogs. A. Monodisperse 1.5 μm AD particles. B. Monodisperse 3.0 μm AD particles.** Mewhinney, J.A.; Hahn, F.F.; Boecker, B.B.; Diel, J.H.; McClellan, R.O.; Mauderly, J.L.; Muggenburg, B.A.; Pickrell, J.A.; Guilmette, R.A. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Beagle dogs have received an inhalation exposure to one of two sizes of monodisperse aerosols of $^{238}PuO_2$ to achieve graded levels of initial lung burden. All animals are being studied over their life span. Sixty-four dogs have died from radiation-related injury with initial lung burdens ranging from 0.025 to 2.2 μCi ^{238}Pu/kg body weight; seven animals died with radiation pneumonitis and pulmonary fibrosis, nine died with lung tumors and 33 animals died with bone tumors. Three control animals have died; 80 exposed and 21 control animals are surviving at 1656 to 2486 days after inhalation exposure.

19304 (LMF—84, pp 129-131) **Primary bone neoplasms in beagle dogs exposed by inhalation to aerosols of $^{238}PuO_2$.** Hahn, F.F.; Mewhinney, J.A.; Merickel, B.S.; Guilmette, R.A.; Boecker, B.B.; McClellan, R.O. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Primary bone neoplasms developed in beagle dogs exposed by inhalation to an aerosol of $^{238}PuO_2$. A portion of the ^{238}Pu in the lung was solubilized and translocated to liver and skeleton. Five years after exposure, 46 osteosarcomas have developed in 35 of 144 exposed dogs. Cumulative absorbed radiation doses to skeleton for these dogs ranged from 210 to 830 rads. Twenty-two of the 46 bone tumors originated in vertebrae, 12 in humeri, 6 in pelves and 6 in miscellaneous long and flat bones. Most of the tumors were well-differentiated osteosarcomas and were associated with lesions of radiation osteodysplasia. Inhaled $^{238}PuO_2$ is an effective skeletal carcinogen and the rate of solubilization may be a major factor in the radiation dose pattern and the resulting type and location of bone tumors.

19305 (LMF—84, pp 132-140) **Toxicity of inhaled $^{239}PuO_2$ in beagle dogs. A. Monodisperse 0.75 μm AD particles. B. Monodisperse 1.5 μm AD particles. C. Monodisperse 3.0 μm AD particles.** Muggenburg, B.A.; Guilmette, R.A.; hahn, F.F.; Boecker, B.B.; McClellan, R.O.; Mauderly, J.L.; Pickrell, J.A. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Studies on the metabolism, dosimetry and biological effects of inhaled particles of $^{239}PuO_2$ in beagle dogs are in progress. To obtain information on the relative importance of homogeneity versus nonhomogeneity of radiation doses to the lung, dogs have been exposed to monodisperse aerosols of $^{239}PuO_2$ of 0.75, 1.5 or 3.0 μm aerodynamic diameter (AD). The exposures have resulted in graded initial lung burdens ranging from 0.0002 to 2.6 μCi/kg body weight. Other dogs were exposed to the aerosol diluent to serve as controls. One dog died at 1035 days after exposure in the 0.75 μm AD study. Twenty-three dogs have died at 152 to 1134 days after exposure in the 1.5 μm AD study and 22 dogs have died at 105 to 1108 days after exposure in the 3.0 μm AD study. These dogs had radiation pneumonitis and pulmonary fibrosis at death. One dog had a small, incidental adenocarcinoma of the lung in the 3.0 μm AD study. The remaining dogs have survived up to 1365 days after exposure and are being observed for the remainder of their life span.

19306 (LMF—84, pp 141-142) **Toxicity of inhaled $^{239}PuO_2$ in immature beagle dogs.** Guilmette, R.A.; Muggenburg, B.A.; Hahn, F.F.; Mauderly, J.L.; Boecker, B.B.; McClellan, R.O. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Immature beagle dogs have been exposed by inhalation to a 1.5 μm aerodynamic diameter monodisperse aerosol of $^{239}PuO_2$ to compare the biological effects with those seen in young adult and aged dogs exposed to a similar aerosol. To date, 18 dogs have been exposed to the aerosol, resulting in graded initial lung burdens ranging from 0.003 to 0.38 μCi/kg body weight. Two dogs have been exposed to the aerosol diluent and serve as controls. Two of the 18 exposed animals were sacrificed 8 days after exposure to provide information on initial deposition and distribution. All other exposed animals are alive 400 days after exposure. No dogs were exposed during the past year because of an outbreak of canine parvovirus enteritis which caused death in 8 to 10 week-old dogs.

19307 (LMF—84, pp 143-145) **Toxicity of inhaled $^{239}PuO_2$ in aged beagle dogs.** Muggenburg, B.A.; Hahn, F.F.; Guilmette, R.A.; Boecker, B.B.; McClellan, R.O. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Studies to determine the effects of age at exposure on metabolism, dosimetry and biological effects of inhaled particles of $^{239}PuO_2$ have been initiated in aged beagle dogs (8.0 to 10.5 years of age at exposure). Beagle dogs have been exposed to 1.5 μm AD particles of $^{239}PuO_2$ resulting in initial lung burdens ranging from 0.03 to 0.76 μCi/kg body weight. Dogs exposed to the aerosol diluent serve as controls. There were four blocks exposed in the past year, one of males and three of female dogs. Nine dogs died during the year. Seven of these had radiation pneumonitis and two died of nonradiation induced diseases. The surviving dogs are as long as 538 days after exposure. There are three blocks of male dogs planned for exposure in the next 12 months.

19308 (LMF—84, pp 146-148) **Repeated inhalation exposure of beagle dogs to aerosols of $^{239}PuO_2$.** Diel, J.H.; Hahn, F.F.; Guilmette, R.A.; Lundgren, D.L. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Dogs are being exposed by inhalation to aerosols of $^{239}PuO_2$ at half-year intervals for 10 years or only once using the same aerosol. A sacrifice series is included to study the distribution of Pu resulting from repeated exposures. All dogs in this study have been exposed at least six times. Up to two years after initiation of exposures the plutonium is retained primarily in the lung. Although three dogs in this experiment have died, no adverse biological effects attributable to the radiation have been observed up to 3 years after initial exposure.

19309 (LMF—84, pp 149-152) **Toxicity of inhaled $^{239}PuO_2$ in Fischer rats.** Redman, H.C.; Griffith, W.C.; Guilmette, R.A.; Mewhinney, J.A.; Scott, B.R.; Boecker, B.B. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Studies are in progress on the biological effects of inhaled particles of $^{239}PuO_2$ in Fischer-344 rats. Information is being obtained on the importance of homogeneity or nonhomogeneity of radiation dose to the lung. The effects of age at exposure are also being evaluated on both young adults and aged animals. Young adult animals were exposed to monodisperse aerosols of 1.0 and 2.85 μm. The aged animals were exposed to 1.0 μm particles.

19310 (LMF—84, pp 153-157) **Distribution, retention and early cytogenetic damage in Cynomolgus monkeys following inhalation of $^{239}Pu(NO_3)_4$.** Brooks, A.L.; Mewhinney,J.A.; Redman, H.C.; Guilmette, R.A.; McClellan, R.O. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Sixteen Cynomolgus monkeys were exposed by inhalation to an aerosol of $^{239}Pu(NO_3)_4$ which resulted in calculated initial lung burdens of 1.0, 0.3 and 0.1 μCi. Four animals were exposed to the carrier aerosol and served as controls. Animals were sacrificed at 4 days and 45 days after exposure to determine the distribution and retention of the aerosol. The amount of plutonium in the liver, skeleton and testes increased as a function of time after exposure. Two monkeys died 155 and 188 days after inhalation exposure from radiation pneumonitis and fibrosis. There was a doubling of the total chromosome aberration frequency in the blood lymphocytes and a significant increase in dicentric chromosomes in the animals exposed for 6 months to initial lung burdens of 1.0 μCi.

19311 (LMF—84, pp 158-161) **Effects of inhalation of $^{239}PuO_2$ on immune responses following lung immunization.** Bice, D.E.; Harris, D.L.; Brooks, A.L.; Mewhinney, J.A. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Results of this study indicated that the number of antibody-forming cells in lung-associated lymph nodes after intratracheal immunization was significantly lower in animals exposed to $^{239}PuO_2$. Only a few antibody-forming cells were found in spleen and cervical lymph nodes. Thus, $^{239}PuO_2$ exposure suppressed immune responses in lung-associated lymph nodes, although their filtering capacity was unaffected and antigen did not translocate to the spleen. Changes in immunologic responses were observed as the animals aged and the number of antibody-forming cells gradually decreased in the lung-associated lymph nodes and increased in the spleen.

19312 (LMF—84, pp 162-164) **Evaluation of lung immunity in chimpanzees.** Bice, D.E.; Harris, D.L.; Muggenburg, B.A.; Bowen, J.A. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The effects of inhaled pollutants on the immune defenses in the lung can be studied in several animal species. To assure that the data obtained can be extrapolated to man, it is essential that the development of lung immunity is similar in the experimental animal selected and in humans. Because of the similarity of immune responses in chimpanzees and in humans, the development of immunity in the chimpanzee after lung immunization was evaluated. The results from the chimpanzees were qualitatively the same as those from previous studies in which single lung lobes of dogs were immunized. It was concluded that immunotoxicology data obtained in dogs can be used to estimate the effects of inhaled pollutants on the immune defense mechanism in the human lung.

19313 **(PNL—3503) HADOC: a computer code for calculation of external and inhalation doses from acute radionuclide releases.** Strenge, D.L.; Peloquin, R.A. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Apr 1981. Contract AC06-76RL01830. 204p. NTIS, PC A10/MF A01.

The computer code HADOC (Hanford Acute Dose Calculations) is described and instructions for its use are presented. The code calculates external dose from air submersion and inhalation doses following acute radionuclide releases. Atmospheric dispersion is calculated using the Hanford model with options to determine maximum conditions. Building wake effects and terrain variation may also be considered. Doses are calculated using dose conversion factor supplied in a data library. Doses are reported for one and fifty year dose commitment periods for the maximum individual and the regional population (within 50 miles). The fractional contribution to dose by radionuclide and exposure mode are also printed if requested.

19314 **Nitrogen-13-labeled nitrite and nitrate: distribution and metabolism after intratracheal administration.** Parks, N.J.; Krohn, K.A.; Mathis, C.A.; Chasko, J.H.; Geiger, K.R.; Gregor, M.E.; Peek, N.F. (Univ. of California, Davis). *Science ;* **212**: 58-61(3 Apr 1981).

Radioactive nitrogen-13 from nitrite (NO_2^-) or nitrate (NO_3^-) administered intratracheally or intravenously without added carrier to mice or rabbits was distributed evenly throughout most organs and tissues regardless of the entry route or the anion administered. Nitrogen-13 from both anions was distributed uniformly between plasma and blood cells. Rapid in vivo oxidation of NO_2^- to NO_3^- at concentrations of 2 to 3 nanomoles per liter in blood was found. No reduction of $^{13}NO_3^-$ to $^{13}NO_2^-$ was observed. A mechanistic hypothesis invoking oxidation of $^{13}NO_2^-$ by a catalase-hydrogen peroxide complex accounts for the results.

19315 **Nonspecific inhibition of alloantigen-induced proliferation by bone marrow natural regulatory cells.** Dorshkind, K.; Rosse, C. (Univ. of Washington, Seattle). Contract EY-76-06-2225. *Transplantation Society, International Congress, Proceedings ;* **13**: No. 1, 1182-1186(Mar 1981).

From 8. international congress of the Transplantation Society; Boston, MA, USA (29 Jun 1980).

We have previously reported that a lymphocyte-enriched fraction ofmurine bone marrow (BML) contains natural regulatory cells (NRC) that can inhibit in vitro proliferative and cytotoxic responses to alloantigens on a dose-dependent basis. In view of the potential importance of these cells to the outcome of bone marrow transplantation, we have undertaken a series of studies designed to inestigate the properties of the effector cell(s). Since clinical and experimental bone marrow transplantation is often performed by ino-

culating histoincompatible marrow into irradiated hosts, we have investigated the effects of irradiation on NRC and their ability to function across major and minor histocompatibility barriers. In this brief communication, we report that NRC can nonspecifically inhibit cellular immune responses across histocompatibility barriers and are not affected by high doses of irraddiation. In addition, we report that NRC are not T or B lymphocytes.

19316 RBE values for radiation-induced growth delay in rat rhabdomyosarcoma tumors exposed to plateau and peak carbon, neon and argon ions. Tenforde, T.S.; Tenforde, S.D.; Crabtree, K.E.; Parks, D.L.; Schilling, W.A.; Parr, S.S.; Flynn, M.J.; Howard, J.; Lyman, J.T.; Curtis, S.B. (Lawrence Berkeley Lab., CA). Contract W-7405-ENG-48. *International Journal of Radiation Oncology, Biology and Physics ;* **7**: No. 2, 217-221(Feb 1981).

Volume regression and regrowth characteristics of rat rhabdomyosarcoma tumors were monitored folowing exposure to plateau (high-energy) and peak (low-energy) charged-particle beams accelerated at the Berkeley BEVALAC facility. Values of the relative biological effectiveness (RBE) for radiation-induced growth delay were obtained for plateau and extended-peak radiation from carbon, neon and argon ions. The RBE values for tumor irradiation in the distal position of a 4 cm peak region of these three ion beams were similar; they ranged from 2.3 to 2.6 for the endpoint of a 50-day delay in growth to twice the volume measured on the day of irradiation. In contrast, RBE values for plateau carbon, neon and argon ions were 1.3, 1.8 and 2.9, respectively, for the 50-day growth delay end point. A therapeutically advantageous peak to plateau RBE ratio was thus obtained only with the carbon-ion and neon-ion beams. These in vivo results are consistent with in vitro measurements of RBE indifferent regions of the Bragg curves of the charged-particle beams used in the present study.

19317 Dependence of RBE on fraction size for negative pi-meson induced renal injury. Jordan, S.W.; Yuhas, J.M.; Butler, J.L.B.; Kligerman, M.M. (Univ. of New Mexico, Albuquerque). *International Journal of Radiation Oncology, Biology and Physics ;* **7**: No. 2, 223-227(Feb 1981).

A method is described for quantitation of murine late renal radiation response using histopathologic grading. Effective dose-50 percent (ED_{50}) is defined as the radiation dose at which 50% of animals showed renal tubular alterations of a specific histologic grade. The designated histologic grade was selected on the basis of its correlation with renal failure manifested by elevated blood urea nitrogen levels, weight loss and mortality of the experimental animals. Using this system, the ED_{50} was determined for single, two, five, and fifteen (daily) fraction exposures with 300 kVp x rays and negative pi-meson (pion) beams generated at the Los Alamos Meson Physics Facility. The correlation between total radiation dose and the number of fractions was linear for both x ray and pion exposures when plotted on logarithmic coordinates, i.e. this relationship followed a power function. The relative biological effectiveness (RBE) for pions increased from 1.12 for a single dose of 1130 rad, to 2.18 for 15 daily fractions of 145 rad. This latter fraction size approaches that being used in clinical trials, and provides an estimate of the RBE to be expected for kidney injury under conventional treatment protocols.

19318 Foliar retention and leachability of submicron plutonium and americium particles. Cataldo, D.A.; Garland, T.R.; Wildung, R.E. (Battelle Paciiic Northwest Lab., Richland, WA). Contract AC06-76RL01830. *Journal of Environmental Quality ;* **10**: No. 1, 31-37(Jan 1981).

Submicron particles of Pu and Am were aerosolized, deposited onto foliage of bush bean (Phaseolus vulgaris L.), and their subsequent retention and behavior determined. Particles having mass median diameters of <1 μm are not readily dislodged from leaf surfaces at wind speeds of approx. 400 m min^{-1}. Under conditions of simulated rainfall, weathering half-times range from 164 to 1000 days, and are dependent on both particle size and initial solubility. The residence time of contaminants on foliar surfaces prior to leaching influences subsequent foliar retention and leachate characteristics. Foliar retention of particles ranges from 20 to 92% and is dependent on particle size of Pu- and Am-oxides, chemical form of Pu, and environmental conditions such as humidity, simulated rainfall, and acidity of the simulated rain.

19319 Subcellular distribution of intraportally injected ^{125}I-labeled insulin in rat liver. Izzo, J.L.; Roncone, A.M.; Helton, D.L.; Izzo, M.J. (Univ. of Rochester, NY). *Archives de Biologie (Liege) ;* **198**: No. 1, 97-109(Nov 1979).

Time course studies revealed that at 30 s after intraportal injection of 200 μU of ^{125}I-labeled insulin per 100 g rat 47.9 +- 2.8% of the injected radioactivity was recovered from the liver homogenate by precipitation with trichloroacetic acid. Trichloroacetic acid precipitable radioactivity declined to very low levels during the next 30 min whereas trichloroacetic acid soluble radioactivity reached a peak value of 9.56 +- 1.9% at 5 min and declined gradually thereafter. Most of the trichloroacetic acid precipitable activities in the subfractions were immunoprecipitable. Trichloroacetic acid soluble radioactivity was found mainly in the cytosol and microsomal fractions. Peak specific activity (percentage of injected dose/mg protein x 10^{-3}) was highest in the microsomes, intermediate in the plasma membranes, and very low in the purified nuclei and partially purified mitochondrial fraction. The specific activity of the microsomes remained at or near peak levels for 5 min after ^{125}I-labeled insulin injection and then declined, whereas specific activity of the plasma membranes dropped precipitously to 25% of peak values at 5 min.

5602 Thermal Effects

REFER ALSO TO CITATION(S) 19374

5603 Chemicals Metabolism And Toxicity

REFER ALSO TO CITATION(S) 18507, 19060, 19204, 19269, 19272, 19273, 19280, 19597

19320 (LA-UR—81-986) Genotoxic effects of sunlight-activated waste waters. Strniste, G.F.; Chen, D.J.; Okinaka, R.T. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 22p. (CONF-810357—1). NTIS, PC A02/MF A01.

From 7. FDA's science symposium on photochemical toxicity; Bethesda, MA, USA (16 Mar 1981).

Natural sunlight induces a genotoxic response in cultured CHO cells pre-treated with shale oil retort process water. Near ultraviolet light (NUV) component of the solar spectrum is the apparent radiation responsible for photoactivation. Cultured human skin fibroblasts are acutely sensitive to the genotoxic effects of photoactivated process water. The mutagenic potential of photoactivated process water in human cells is the same as that witnessed for an equivalent killing dose of the potent skin carcinogen FUV. DNA repair processes are involved in modulating genotoxic effects of this photo-induced process. The exact magnitude of the potential health-related and environmental risks resulting from photoactivation of retort process waters and other oil shale by-products is unassessed at this time. Our demonstration that a significant rate of mutation occurs in cultured human cells exposed to high dilutions of process waters and fluences of NUV comparable to that encountered during nominal exposure to sunlight suggests that such assessment is a prerequisite to minimal risk development of our oil shale resources.

19321 (LBL—10847) Relationship between cancer incidence and two pollutants (total suspended particulate and carbon monoxide) for the San Francisco bay area. Selvin, S.; Sacks, S.T.; Merrill, D.W.; Winkelstein, W. (Lawrence Berkeley Lab., CA (USA)). 5 Jun 1980. Contract W-7405-ENG-48. 38p. NTIS, PC A03/MF A01.

Data from the Third National Cancer Survey were analyzed in conjunction with air quality data, in an investigation of possible associations between site-specific cancer incidence and levels of two pollutants, total suspended particulate (TSP) and carbon monoxide (CO), in the San Francisco Bay Area. Median family income of the census tract of residence was used to stratify the cancer incidence cases according to socio-economic status. The results are consistent with earlier investigations reporting associations between TSP levels and cancer. No such association is found for CO.

19322 (LMF—84, pp 173-176) **Influence of driving cycle, fuel type and oxidative catalyst on mutagenic activity of diesel particles.** Brooks, A.L.; Sturm, J.C.; Hanson, R.L.; Clark, C.R.; Royer, R.E.; Walter, R.A.; Quayle, S.S.; McClellan, R.O. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

A naturally aspirated Fiat 131 prototype diesel automobile was operated on standard driving cycles, using two fuels characterized by low and high sulfur content, with and without an oxidative exhaust catalyst. The mutagenic activity of CH_2Cl_2 extracts of exhaust particulates was determined using Ames Salmonella strains TA-98 and TA-100. The extracts from Highway Fuel Economy Test (HFET) driving cycle had the lowest mutagenic activity. The New York City Cycle and the Federal Test procedure had increased levels of NO/sub x/, CO and hydrocarbons and the mutagenic activity of CH_2Cl_2 extract was about twice that from the HFET. The concentration of sulfur in the fuel had little influence on the mutagenic activity in the exhaust when the car was operated without an oxidative catalyst. The car operated with the catalyst and low sulfur fuel produced exhaust extract with increased mutagenic activity per μg of extract, but that did not increase the revertants per mg of particulate material. The car operated with a catalyst using high sulfur fuel resulted in a marked decrease in both the mutagenic activity per μg of extract and per mg of particles emitted.

19323 (LMF—84, pp 177-182) **Bacterial mutagenicity and mammalian cytotoxicity of diesel particle extracts: influence of car type and fuel composition.** Clark, C.R.; Li, A.P.; Royer, R.E.; Brooks, A.L.; McClellan, R.O.; Marshall, W.F. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Evaluation of extracts of diesel particles collected from the exhaust of six American and European diesel cars was done in the Salmonella mutagenicity test (TA 100) and for toxicity in cultured Chinese hamster ovary (CHO) cells. No significant differences were observed in the mutagenicity of particle extracts collected in triplicate runs of the same car (three cars evaluated) or in particle samples collected from five different Oldsmobile 350 diesel cars operated under the same conditions. Mutagenicity of particle extracts collected from six different cars ranged from 3 to 14 revertants per μg extract and correlated well with toxicity in CHO cells. An inverse correlation between mutagenicity of the extracts and amount of organics associated with the particles was observed. Fuel composition had little influence on the resultant mutagenicity of particle-associated organics.

19324 (LMF—84, pp 188-190) **Influence of nonpetroleum fuel extenders on mutagenicity of diesel exhaust particulate extracts.** Clark, C.R.; Marshall, W.F.; Seizinger, D.E.; Naman, T.M. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The mutagenicity of organic solvent extracts of diesel engine exhaust particles, collected while the engine was running on diesel fuel alone, was higher than when 10% ethyl alcohol, butyl alcohol and SRC-II (solvent refined coal liquid) were added to the diesel fuel (Salmonella strain TA-100). However, the three fuel extenders increased the total amount of organics associated with the exhaust particles resulting in a greater content of mutagenic components (revertants/mg) emitted from the exhaust per unit time than seen with diesel fuel alone. With the exception of slightly higher levels of carbon monoxide, the fuel extenders did not greatly alter total hydrocarbons, oxides of nitrogen, particulate emissions, or fuel economy.

19325 (LMF—84, pp 191-197) **Chemical differences in mutagenic fractions of diesel particulate extracts.** Hanson, R.L.; Brooks, A.L.; Royer, R.E.; Clark, C.R. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The mutagenic fractions of extracts of diesel exhaust particles were analyzed by gas chromatography/mass spectrometry. Different fuels produced exhaust particles from the same engines with different chemical compositions and relative mutagenicities. The mutagenicity of the exhaust particles collected after an oxidative catalyst was greater than the mutagenicity of the exhaust particles from the engine without the oxidative catalyst. Nitroarenes may be present in the extracts of diesel exhaust particles and be responsible for the direct acting mutagenicity of these samples.

19326 (LMF—84, pp 198-201) **Influence of filter loading on the mutagenicity of diesel particulate exhaust extracts.** Clark, C.R.; Gorse, R.; Salmeen, I.T. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Organic solvent extracts of diesel particulate exhaust were collected on Zefluor, Tissuquartz, and Pallflex T60A20 filters while the car was operated on the Federal Test Procedure/hot start (FTP/H) cycle. Extracts of filters used to collect the particulate exhaust from a single FTP/H cycle were slightly less mutagenic (Salmonella strain TA-100 without liver enzyme preparation) than extracts of filters used to collect 7 to 10 FTP/H cycles. Only slight differences in mutagenicity were observed with filter loadings ranging from 0.01 to 0.51 mg/cm^2. No significant differences in mutagenicity were observed among similarly loaded filters.

19327 (LMF—84, pp 202-205) **Concentration of mutagenic activity in diesel exhaust extracts for chemical analysis.** Henderson, T.R.; Royer, R.E.; Hanson, R.L. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Gel chromatography on Sephadex LH-20 and dimethylsulfoxide/hexane solvent partitioning were found satisfactory for concentrating the direct-acting mutagens in diesel exhaust extracts. The aromatic fraction isolated with dimethyl sulfoxide had about twice the specific activity of the most active Sephadex fraction. Gas chromatography/mass spectrometry detected primarily polynuclear aromatic hydrocarbons of the 3- and 4-ring classes, but no recognizable direct-acting mutagens. Gas chromatographic analyses of aromatic fractions showed that peaks of neutral nitrogen containing compounds could be detected with a thermionic detector and that low levels of nitro-aromatics could account for some of the direct mutagenic activity of diesel exhaust.

19328 (LMF—84, pp 206-210) **Increased mutagenicity and cytotoxicity of diesel fuel aromatics after reaction with NO_2.** Henderson, T.R.; Li, A.P.; Royer, R.E.; Clark, C.R. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Gas chromatography/mass spectrometry (GC/MS) of diesel fuel aromatics detected two to three ring polynuclear aromatic hydrocarbons. Reaction with NO_2 resulted in the formation of nitroaromatics, of which only the naphthyl and biphenyl nitroaromatics were detectable by direct GC/MS. By derivitization to aryl-iodides, it was possible to demonstrate that nitro-derivatives of most of the starting aromatics were present after NO_2-treatment. The starting fractions were inactive, but after reaction with NO_2, the products contained frameshift mutagens which did not require activation by S-9 microsomal enzymes. The LC_{50} to CHO cells in culture decreased more than five fold. Reaction of fuel aromatics with NO_2 may be one mechanism which contributes to the formation of cytotoxic and mutagenic activities in diesel exhaust.

19329 (LMF—84, pp 214-218) **Cytotoxicity and mutagenicity of diesel exhaust particle extract on mammalian cells in culture.** Li, A.P.; Royer, R.E. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Diesel exhaust particle extract was found to be cytotoxic, but not significantly mutagenic in Chinese hamster ovary (CHO) cells. The cytotoxicity was decreased by serum, bovine serum albumin, sulfhydryl compounds and lung and liver cytosols. Addition of co-factors to the cytosols further decreased the cytotoxicity, suggesting enzymatic detoxification. An extract that was found to be mutagenic in bacteria did not induce significant mutations at the

HGPRT gene locus in CHO cells in either the absence or presence of liver S-9.

19330 (LMF—84, pp 219-222) **Influence of aging diesel particles in the peritoneal cavity of rats or in daytime environment on their associated mutagenic activity.** Brooks, A.L.; Bay, M.; Clark, C.R. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Diesel particles were aged either by placing them in millipore diffusion chambers and implanting the chambers in the pertioneal cavity of rats or by placing particles in the daytime outdoor environment. The influence of these treatments on the mutagenic activity of the CH_2Cl_2 extractable organics was measured as a function of aging time. The mutagenic activity decreased slightly for both conditions. However, the rate and magnitude of the decrease was small. This suggests that the mutagenic activity associated with diesel particles may have a long persistence in the environment.

19331 (LMF—84, pp 225-229) **Deposition and retention of ultrafine aggregated aerosols in beagle dogs and rats.** Wolff, R.K.; Kanapilly, G.M.; Griffis, L.C.; Gray, R.H.; McClellan, R.O. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Ten beagle dogs were exposed to 0.02 and 0.1 μm aggregated aerosols of $^{67}Ga_2O_3$ and deposition measured using gamma camera analysis. Total deposition was 53% and 39% and pulmonary deposition was 32% and 25% for the 0.02 and 0.1 μm aerosols, respectively. Rats were exposed to the same 0.1 μm aggregates for either 1 day or 3 days. Deposition was somewhat lower than for dogs ($\sim$ 15% pulmonary deposition). Retention data from these surrogate diesel aerosols were used to predict particle accumulations in rats chronically exposed to diesel exhaust.

19332 (LMF—84, pp 230-232) **Generation of ultrafine aggregated particles coated with benzo(a)pyrene.** Wolff, R.K.; Kanapilly, G.M.; Sun, J.D. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

An aerosol generation system has been designed and tested for production of Ga_2O_3 aggregate particles coated with benzo(a)pyrene. Ga_2O_3 aggregate particles were produced by vaporization and degradation of Ga-tetramethylheptanedione. These particles were used as condensation nuclei in a benzo(a)pyrene (BaP) vaporizer to produce coated particles without any homogeneously nucleated BaP aerosol. A variety of operating conditions have been determined to produce particles of various sizes and degrees of coating. Such particles are intended for use in inhalation experiments as model compounds for diesel exhaust particles.

19333 (LMF—84, pp 236-239) **Performance evaluation and design of a buffer tank system to damp cyclic gas concentration variations.** Mokler, B.V. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The engine cycle selected to provide diesel exhaust for exposure studies produces exhaust at a fluctuating rate. This presents a serious difficulty in the use of gas analysis instruments with slow response speeds. The problem, which could have led to inaccurate concentration data, was overcome by using a buffer tank system to damp the cyclic variations. The experimental and mathematical bases for designing the buffer system are summarized in this paper.

19334 (LMF—84, pp 240-245) **Exposure system for chronic exposure of rodents to diesel exhaust.** Mokler, B.V.; Kelly, C.P.; Lopez, J.A.; Redman, H.C.; Weissman, S.H.; Beethe, R.L.; Stafford, D.L.; Mauderly, J.L. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The exposure of large numbers of rats and mice to diluted diesel exhaust for 7 hours per day over many months required the design and construction of an extensive exposure system. The system consists of two principal sections; (a) a 5.7 liter displacement diesel engine mounted on a stationary test stand and coupled to an eddy current dynamometer via an automatic transmission, and (b) an exhaust dilution and delivery section for exposing animals at three different exhaust concentrations or ambient air. This section has provision for exposure and housing of animals within a series of large moveable chambers. The total system is supported by a computerized control monitoring and data collection and storage unit. The principal components and characteristics of the system are described.

19335 (LMF—84, pp 246-260) **Observations on rodents exposed for up to twelve weeks to diesel exhaust.** Mauderly, J.L.; Benson, J.M.; Bice, D.E. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Rats and mice were exposed by inhalation to diluted, whole diesel exhaust for up to 307.5 hours during a 12-week period. Exhaust was generated by a General Motors 5.7 l displacement engine burning a No. 2 reference fuel on an urban operating cycle. Groups were exposed to concentrations of approximately 4300, 1050, and 250 $\mu g/m^3$ of particulate. Animals were withdrawn for study after 1, 3, 6, 9 and 12 weeks of exposure. Biological endpoints included biochemical and cytological indices, tracheal mucociliary clearance velocity, defenses against bacterial infection, immunological responses, respiratory function and morphology. Health effects from the exposure were minimal. A mild inflammatory reaction occurred early and was resolved by 12 weeks. Particle clearance in the trachea and deep lung was slowed. Immunologic responses and levels of enzymes metabolizing hydrocarbons were altered slightly. There were no changes in respiratory function or in situ killing of inhaled bacteria.

19336 (LMF—84, pp 263-269) **Health and environmental effects from increased use of light duty diesel vehicles in the United States.** Cuddihy, R.G.; Seiler, F.A.; Griffith, W.C.; Scott, B.R.; McClellan, R.O. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The potential environmental effects and human health risks from increased use of diesel light duty vehicles were evaluated in the first of a series of yearly reports on this topic. It includes the impacts of supplying diesel fuel and light duty vehicles, public use of these vehicles and vehicle service and disposal of waste products. The projected increases in environmental pollutants assuming 20% diesel light duty vehicles were small compared to levels of these pollutants that currently exist in major US cities. Likewise, cancer risks to the general public exposed to diesel emissions are likely to be small. Further reports will focus on the potential for long-term accumulations of diesel-related pollutants in the environment and on the risks of injury from acute exposures to high levels of emissions that may occur in poorly ventilated areas.

19337 (LMF—84, pp 270-273) **Procedure for estimating the expected tumor incidence after exposure to a mixture of genotoxic carcinogens.** Scott, B.R. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Because particulate-polycyclic-organic matter from diesel engine exhaust contains known genotoxic procarcinogens and cocarcinogens, it is important to develop methods of estimating tumor risks after exposure to such mixtures. A procedure for estimating tumor risks after exposure to a mixture of genotoxic carcinogens is described in this paper. A new dose-response model for estimating lifetime-tumor risks along with the relative potency approach for combining doses of different toxic chemicals are used together to predict excess tumor incidences after exposure of mice to as many as 12 polycyclic aromatic hydrocarbons.

19338 (LMF—84, pp 279-285) **Summary of physical and chemical characterization of atmospheric pressure fluidized bed combustor effluents: current status.** Carpenter, R.L.; Newton, G.J.; Barr, E.B. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

In conjunction with the Morgantown Energy Technology Center, the Inhalation Toxicology Research Institute has been characterizing the effluents from fluidized bed coal combustion as to their physical and biological behavior. The study examines a wide range of atmospheric pressure fluidized bed combustors (AFBC) operating conditions and a number of fuels. These operating conditions span the range of maximum SO_2 capture and minimum NO/ sub X/ production. The results to date indicate that the fly ash escaping the AFBC cleanup system is respirable with a mass median aerodynamic diameter $\simeq$ 2 μm. It is found that AFBC particle emissions are comparable or lower than those from conventional power plants, that AFBC organic emissions are primarily in the vapor phase and that AFBC trace element emissions are comparable to conventional power plant emissions.

19339 (LMF—84, pp 290-294) **Evaluation of organic vapor adsorbents for sampling fossil fuel combustion effluents.** Hanson, R.L.; Clark, C.R.; Hobbs, C.H.; Carpenter, R.L. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Tenax-GC and Amberlite XAD-2 are porous polymeric adsorbents used to sample organic vapors in effluents from fossil fuel combustion technologies. Both polymers decompose in the presence of nitrogen oxides which are also present in the combustion effluent streams. The decomposition products from Tenax-GC exposed to NO and NO_2 were not mutagenic in a Salmonella mutagenicity assay and did not interfere with the gas chromatographic elution and analysis of vapor phase organics adsorbed on the polymer. The NO_2-decomposition products of XAD-2 eluted with retention characteristics similar to the vapor phase organics and were mutagenic. These results suggest that XAD-2 should not be used to sample vapor phase organics in fossil fuel combustion effluent streams for chemical analysis and bioassay.

19340 (LMF—84, pp 319-325) **Cytotoxicity and mutagenicity of potential effluents from fluidized bed combustion of coal.** Hill, J.O.; Clark, C.R.; Hanson, R.L.; Carpenter, R.L.; Gray, R.H.; DeNee, P.B.; Hobbs, C.H. Dec 1980. NTIS, PC A99/MF A01.

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FBC fly ash samples were studied for cytotoxicity in canine alveolar macrophages and for mutagenicity in the Salmonella (Ames) bioassay. Compared to a respirable quartz particle standard, none of the fly ash samples tested were cytotoxic to macrophages at concentrations up to 100 μg/10^6 cells (100 μg/ml). Dichloromethane extracts of fly ash, however, were often mutagenic. The mutagenic activity generally increased with (1) increasing distance from the combustor bed, (2) increasing combustor temperature, and (3) decreasing particle size. Vapor-phase hydrocarbons were not mutagenic.

19341 (LMF—84, pp 326-329) **Surface properties of FBC ash and activation of immune complement.** Rothenberg, S.J.; Hill, J.O.; Hanson, R.L.; Kanapilly, G.M. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Activation of the immune complement system by Montana Rosebud fly ash was studied. Samples of ash were heat-treated and extracted with dichloromethane, saline and water. The effect of these treatments on the specific surface area of the ash and on the ability of the ash to activate the immune complement system was determined. Heat treatment reduced both complement activation and specific surface area. Organic extraction with dichloromethane did not reduce the complement activation by the ash but extraction with either saline or water removed this activity.

19342 (LMF—84, pp 330-333) **Fly ash adsorption of pulmonary surfactant.** Henderson, R.F.; Rothenberg, S.J. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

A study of the ability of respirable particulate matter to bind the surfactant material lining the alveoli of the lung was made. Fly ash from an electrostatic precipitator of a conventional coal combustor and size-selected ash collected in a cascade impactor in the stack breech of an experimental fluidized bed coal combustor (FBC) were studied. Adsorption of surfactant material on porous FBC ash was both size- and time-dependent. Rapid adsorption took place within a half hour and larger quantities adsorbed per mg ash on the smaller particles. Adsorption of surfactant on the glass-like conventional ash was ~ one-tenth that of the FBC ash and did not increase with time.

19343 (LMF—84, pp 334-336) **Gastrointestinal absorption of coal combustion fly ash in the rat.** Griffis, L.C.; Pino, M.V. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The gastrointestinal (GI) absorption of radioactivity from neutron activated fly ash from a pulverized coal combustor (PCC) and a fluidized bed combustor (FBC) was compared in rats. After 72 hours approximately 0.8% of the PCC fly ash radioactivity and 4.9% of the FBC ash radioactivity were absorbed. The fly ashes and feces contained ^{157}Eu, ^{134}Cs, ^{54}Mn, ^{46}Sc, ^{59}Fe, ^{60}Co and a trace of ^{75}Se while the urine and liver contained mostly ^{75}Se, ^{134}Cs and ^{60}Co. The GI tract may be a more important exposure route for FBC fly ash relative to PCC ash and some elements were preferentially absorbed.

19344 (LMF—84, pp 337-339) **Cellular kinetics of pulmonary injury following acute fly ash exposure.** Hackett, N.A.; Brooks, A.L.; Felicetti, S.A. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

This study determined the impact of fly ash inhalation on the rate of lung cell turnover in rats. Fisher-344 rats were exposed for 6 hours to 142 mg/m^3 of fly ash effluent from an experimental fluidized bed coal combustor. Changes in cell proliferation and turnover rates were assessed by intraperitoneal injection of tritiated thymidine (^{3}HTdR) followed by serial sacrifice of the animals and autoradiography of tissue sections. In the animals which inhaled fly ash, ^{3}HTdR incorporation was increased over controls. Peak labelling indices were 2% for the type II epithelial cells, 6% for the alveolar macrophages, 1% for tracheal epithelial cells and approximately 0.5% labelled in small airway epithelium. Results suggest damage to the lungs and demonstrate a change in cell proliferation in airway and alveolar epithelium and in free macrophages.

19345 (LMF—84, pp 340-343) **Long-term retention of monodisperse and polydisperse particles inhaled by beagle dogs, rats and mice.** Snipes, M.B. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Beagle dogs, rats and mice were exposed by inhalation to 0.7, 1.5 or 2.8 μm aerodynamic diameter (AD) particles or 1.5 to 2.0 μm activity median aerodynamic diameter (AMAD) polydisperse particles to study long-term retention. Particles were relatively insoluble heat-fused aluminosilicate, labeled with ^{134}Cs. For all species, larger particles were retained longer. Rates for particle accumulation in tracheobronchial lymph nodes were slowest for smaller and highest for larger particles. Results indicate an effect of particle size on lung clearance which would have a marked effect on dosimetry, depending on particle size for the inhaled material.

19346 (LMF—84, pp 344-347) **Clearance of particles from individual lung lobes and peritoneal cavity to regional lymph nodes.** Snipes, M.B.; Muggenburg, B.A.; Bice, D.E. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Beagle dogs had radiolabeled particles instilled deep into a specific lung lobe or injected into the peritoneal cavity. Clearance patterns to specific lymph nodes were measured. Retention half-times for these particles in lungs were similar to those for inhaled particles. Particles which left the lung via the lymphatic system went from each lung lobe to one to two specific lymph nodes. Particles injected into the peritoneal cavity went to mesenteric lymph

nodes or sternal lymph nodes. Particles not cleared from the peritoneal cavity were associated with the mesentery.

19347 (LMF—84, pp 361-363) **Effect of elastase or histamine on single-breath N_2 washouts in the rat.** Likens, S.A.; Mauderly, J.L. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The single-breath N_2 washout (SBNW) was compared to other lung function tests in detecting experimentally-induced disorders in rat lungs. Pre- and post-instillation tests were performed on groups of 15 rats treated with histamine or elastase and on untreated controls. Histamine increased Slope of Phase III of SBNW but didn't change closing volume (CV) or closing capacity (CC). Elastase increased CV and CC, but Slope of Phase III was unchanged. The SBNW discriminated between the two disorders with sensitivity equal to or greater than the other tests.

19348 (LMF—84, pp 375-383) **Physicochemical characteristics of process streams of an experimental low Btu gasifier.** Newton, G.J.; Carpenter, R.L.; Hanson, R.L.; Weissman, S.H.; Henderson, R.F.; Hobbs, C.H.; McClellan, R.O. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Results of physicochemical characterization of process streams at the Morgantown Energy Technology Center's, stirred-bed, Lurgi-type, low Btu coal gasifier are summarized. Data are derived from two sampling efforts, December 1979 and September 1980. Gaseous, liquid and solid process and waste streams were analyzed for physical and chemical characteristics relevant to inhalation hazard assessment.

19349 (LMF—84, pp 423-428) **Toxicological characterization of the process stream of an experimental low Btu coal gasifier.** Benson, J.M.; Hill, J.O.; Royer, R.E.; Hanson, R.L.; Mitchell, C.E.; Newton, G.J. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Materials collected directly from the process stream of an experimental low Btu gasifier have been evaluated for their mutagenic and cytotoxic activites. Materials collected were both mutagenic in the Ames Salmonella assay and cytotoxic to pulmonary alveolar macrophages in culture. Neutral and polar polynuclear aromatics contributed to the biological activity of process stream material. Results indicate that potentially toxic materials are partially removed from the process stream during cleanup and, as a result, risk from exposure to fugitive emissions is reduced.

19350 (LMF—84, pp 432-435) **Identification of cytotoxic compounds in tar from the tar trap of a low Btu gasifier.** Hill, J.O.; Royer, R.E.; Mitchell, C.E. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Macrophage cytotoxicity testing was used to screen Sephadex and silica gel fractions of tar trap tar from a low Btu gasifier and to identify compounds contributing to the cytotoxicity of tar. Four toxic compounds were identified in the neutral subfraction of Sephadex LH-20, fraction 5. A phenol, 9-phenanthol, was the most toxic of the four. Phenanthridone and 2-hydroxyfluorene were also positively identified and were moderately cytotoxic along with the relatively nontoxic nitrogen heterocycle, carbazole. The data suggest that phenols contribute to the cytotoxicity of gasifier tar.

19351 (LMF—84, pp 436-439) **Isolation and characterization of airborne particulate samples at a low Btu gasifier.** Mitchell, C.E.; Hanson, R.L. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Airborne particulate samples were collected in the vicinity of an experimental low Btu gasifier. Sephadex LH-20 chromatography was used to separate dichloromethane extracts of the samples into six fractions. Evaluation in the Salmonella mutagenicity test (TA-98) showed most (70%) of the extractable material was not mutagenic. Mutagenic activity was found in LH-20 Fractions 3, 4 and 5, the fractions that should contain polynuclear aromatic compounds. Both direct and indirect mutagens were found in Fractions 3 and 4 while Fraction 5 contained mainly indirect mutagens. Further subfractionation is necessary to facilitate chemical identification of the mutagens.

19352 (LMF—84, pp 440-442) **Simplification of the CHO/HGPRT mutation assay through the growth of Chinese hamster ovary cells as unattached cultures.** Li, A.P. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

A novel technique for the growth of Chinese hamster ovary (CHO) cells as unattached cells on nontissue culture plates was applied to the CHO/HGPRT mutation assay, using ethyl methane sulfonate and N-methyl, N-nitro, N-nitrosoguanidine as mutagens. Subculturing procedures did not require trypsinization, and the optimum expression time was shortened from 9 to 6 days. Maximum mutation frequency was not changed by the new technique, nor was there any selection for or against the mutant population when mutant and wild-type cells were co-cultivated. Thus, the quantitativeness of the assay was not affected. The new technique could decrease the cost and effort of using the CHO/HGPRT mutation assay in the screening of potential mutagens/carcinogens.

19353 (LMF—84, pp 446-448) **Cytotoxicity and mutagenicity of several organometallic compounds.** Li, A.P. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The cytotoxicity and mutagenicity of several organometallic compounds were studied in Chinese hamster ovary (CHO) cells. The cytotoxicity of dibutyl germanium dichloride ($dBGeCl_2$), diphenyl selenium dichloride ($dPSeCl_2$), dibutyl tin dichloride ($dBSnCl_2$) and diphenyl tin dichloride ($dPSnCl_2$) was studied. The tin compounds were found to be 2000X more cytotoxic than the germanium and selenium compounds. Dibutyl germanium dichloride was found to be mutagenic in the CHO/HGPRT mutation assay. The preliminary data showed that $dBSnCl_2$ was also mutagenic with the mutagenicity being 2000X higher than $dBGeCl_2$.

19354 (LMF—84, pp 449-451) **in vitro metabolism of phenanthridine II: tentative identification of phenanthridone as a metabolite produced by rat liver and lung.** Benson, J.M. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Phenanthridone has been tentatively identified as a major metabolite of phenanthridine formed by rat lung and liver microsomes in vitro. Phenanthridone is directly mutagenic in the Ames Salmonella mutagenicity assay. Incubation with rat liver S-9 further enhances its mutagenic activity. While phenanthridone is more mutagenic than phenanthridine, it is less cytotoxic.

19355 (LMF—84, pp 452-454) **DNA modification in rat lungs following intratracheal or subcutaneous administration of 4-nitroquinoline-1-oxide, benzo(a)pyrene or 2-aminoanthracene.** Harpaz, R.; Mitchell, C.E. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

DNA modification mediated by benzo(a)pyrene, 2-aminoanthracene, and 4-nitroquinoline-1-oxide was investigated in rat lungs using alkaline sucrose gradient sedimentation. The extent of DNA modification varied as a function of the compound, the route and vehicle of exposure, the time following administration and the number of treatments.

19356 (LMF—84, pp 455-457) **Effect of Aroclor or benzo(a)pyrene pretreatment on the covalent binding of ^{3}H-benzo(a)pyrene to mouse lung DNA.** Mitchell, C.E.; Pitman, D.M. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The binding of ^{3}H-benzo(a)pyrene to mouse lung DNA was determined following pretreatment of the mouse with Aroclor or benzo(a)pyrene (BaP) 24 hours earlier. The highest level of binding was found in animals pretreated with BaP. Animals pretreated with vehicle only did not contain sufficient bound radioactivity to detect any DNA-adducts. These studies suggest that the metabolic state of an animal is important in determining the extent of binding of chemicals to macromolecules. These methods should be applicable to determining the binding of other biologically active low Btu gasifier components of PAHs to DNA and the resulting data can be used in assessing the health risks from the inhalation of these materials.

19357 (LMF—84, pp 461-465) **Deposition and clearance of inhaled sulfuric acid in dogs, guinea pigs, and rats.** Dahl, A.R. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Deposition of inhaled ^{35}S-labeled sulfuric acid mists in the size range 0.4 to 1.1 μm activity median aerodynamic diameter (AMAD) was studied in rats, guinea pigs and beagle dogs. Rats deposited more in the upper respiratory tract than did guinea pigs which deposited more than dogs. Both rats and guinea pigs cleared inhaled sulfuric acid much more rapidly from the lungs than would be predicted from instillation studies.

19358 (LMF—84, pp 466-469) **Acute inhalation toxicity of sulfuric acid mist in the presence and absence of respirable particles.** Henderson, R.F.; Gray, R.H.; Hahn, F.F. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Fischer-344 rats were exposed to H_2SO_4 mist (MMAD $\simeq$ 0.8 μm, σ/sub g/ $\simeq$ 1.7) in the presence or absence of 80 mg/m^3 of fly ash (MMAD $\simeq$ 6.0 μm, σ/sub g/ $\simeq$ 2.0) from a fluidized bed coal combustor. Lung damage was estimated by analysis of lung washings. At one day after exposure, lavage fluid from animals exposed to high levels of sulfuric acid alone, to ash alone, or to both showed an increase in sialic acid and in acid phosphatase activity. Lactate dehydrogenase and glutathione reductase activities were elevated in the combined exposures. The presence of a separate particulate aerosol did not greatly modify the response of the rat lung to H_2SO_4.

19359 (LMF—84, pp 474-476) **Generation and characterization of aerosols of P. aeruginosa for use in respiratory tract clearance studies.** Hill, J.O.; Rowatt, J.D.; Sanchez, A.; Kanapilly, G.M. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Aerosols of the respiratory pathogen, Pseudomonas aeruginosa, were generated by the nebulization of an aqueous suspension in a Retec nebulizer and characterized with the use of a cascade impactor and electron microscopy of electrostatic precipitator samples. Depending on the concentration of bacteria in the nebulizer solution, deposition of viable organisms in the upper and lower respiratory trace could be achieved for use in bacterial colonization and clearance studies.

19360 (LMF—84, pp 477-480) **Pulmonary cellular effects of acute nitrogen dioxide inhalation in Syrian hamsters.** Pickrell, J.A.; Pfleger, R.C.; Henderson, R.F. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Syrian hamsters received inhalation exposure to 15, 5 and 1 ppM NO_2 for 8 hours to observe biochemical and cytologic responses of cells present in endobronchial lavage fluid and in the isolated enriched type II cell fraction. NO_2 inhalation at 15 and 5 ppM led to acute inflammation and desquamation of airway epithelium at peak response times. Macrophages at these levels and at 1 ppM made more membrane lecithin, but diverted the palmitate label to neutral lipids. Cells in the isolated enriched type II cell fraction made more cell membrane lecithin, but not more surfactant lecithin, at the peak response times than did control rats. Fewer viable type II cells were isolated from NO_2 exposed lungs, suggesting that these cells were more sensitive to the trypsin isolation procedure than type II cells from control animals.

19361 (LMF—84, pp 481-483) **Effects of acute nitrogen dioxide exposure on cell mediated lung immunity.** Hillam, R.P.; Bice, D.E.; Schnizlein, C.T. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The present study investigated the effects of acute NO_2 exposure on antigen-specific, cellular immunity after lung immunization with sheep red blood cells (SRBC). Cellular immunity was evaluated after lung immunization by antigen-specific lymphocyte stimulation assays of pooled lymphoid cell suspensions from either the lung-associated lymph nodes or spleens. Elevated cellular immunity was observed after exposure to NO_2. The ability of NO_2 exposure to enhance cellular immunity seemed to parallel, and in some cases even exceed, that seen in control group immunization with SRBC mixed with heat-killed bacillus calmette-Guerin organisms as an adjuvant. These results can be interpreted to support the theory that the NO_2 induced lung damage and/or alterations of regulatory populations of immune cells is responsible for the production of an abnormally elevated immune response to antigens deposited in the lung.

19362 (LMF—84, pp 484-486) **Pathogenesis of nitrogen dioxide induced lung disease in the dog.** Johnson, W.K.; Hahn, F.F.; Gray, R.H. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The pathogenesis of the early effects of nitrogen dioxide (NO_2) exposure was studied in the beagle dog and found to differ significantly from the response of smaller laboratory animals. Ten beagle dogs were exposed to 70 ppM NO_2 for six hours and sacrificed at 0.1, 1, 2, 3, 7 and 14 days post-exposure (DPE). The dramatic type I pneumocyte damage and the subsequent type II pneumocyte hyperplasia which occurs in small animals was not observed. An increase in the number of alveolar pores and mean linear intercept 7 to 14 DPE indicated permanent damage.

19363 (LMF—84, pp 489-492) **Generation and characterization of ethylene glycol vapors and aerosols.** Cheng, Y.S.; Marshall, T.C.; Kanapilly, G.M. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Methods for generating ethylene glycol vapors and aerosols for short-term animal exposure are described. Experimental conditions were established for stable vapor output by vaporizing ethylene glycol in a furnace. The vapor concentration increased with vaporization temperature and leveled off at temperatures exceeding 110°C. The maximum concentration was around 310 μg/l, close to the saturated ethylene glycol vapor concentration at room temperature and 620 Torr ambient pressure. A vaporization-condensation method was used to form ethylene glycol droplets on Ga_2O_3 nuclei. Mass median aerodynamic diameters as determined by a Mercer impactor were around 1.2 μm.

19364 (LMF—84, pp 493-496) **Deposition and fate of ethylene glycol in the rat following vapor inhalation exposure.** Marshall, T.C.; Cheng, Y.S. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Rats were exposed nose-only to ^{14}C-ethylene glycol vapor at a concentration of 32 μg/l. Approximately 61% of the amount inhaled was deposited, primarily in the nasopharyngeal region. Blood levels of radioactivity remained relatively constant during the first 6 hours after exposure, then declined by apparent first-order kinetics with a half-time of 53 hours. The predominant routes of elimination were via the expired air (65% of the initial body burden) and the urine (20%). It is unlikely that blood levels of sufficient magnitude to saturate ethylene glycol oxidative metabolism, which is related to acute toxic symptomatology, would result from acute inhalation of ethylene glycol vapors.

19365 (LMF—84, pp 497-500) **Ocular toxicity of 2,2,2-trifluoroethanol in rabbits.** Marshall, T.C.; Hahn, F.F.; Merickel, B.S.; Hobbs, C.H. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Three commercial formulations of 2,2,2,-trifluoroethanol (TFE), Fluorinol 50, 85 and 100, were applied to eyes of rabbits and evaluated for their potential to cause ocular damage. All three products were severe eye irritants and water irrigation shortly after exposure was not effective in reducing ocular damage. Gross and histopathological observations revealed moderate to severe corneal opactities, iritis and marked conjunctivitis, all of which showed evidence of healing over the 3 week course of investigation. However, complete reversal of all effects was not attained. TFE and its commercial formulations should be viewed as potentially severe human ocular irritants.

19366 (LMF—84, pp 506-508) **Determination of lung burdens of glass after exposure to a glass fiber aerosol.** Griffis, L.C.; Pickrell, J.A. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Inhalation toxicology studies of glass fibers require knowledge of the dose deposited in the lungs of exposed animals. The quantity of acid-insoluble sodium in the lungs of rats exposed to a glass fiber aerosol was used to determine the resulting lung burdens of glass. Five 6-hour exposures to 47 mg/m^3 resulted in a lung burden of 176 μg of glass. An estimated 41 to 48% of the lung burden underwent early clearance between daily exposures. An in vitro dissolution study indicated that some sodium is preferentially dissolved from the glass but this should have only a small impact on the accuracy of the method.

19367 (LMF—84, pp 509-513) **in vitro and in vivo response to insulation fibers.** Pickrell, J.A.; Hill, J.O.; Hahn, F.F.; Straus, F.C.; Rebar, A.H.; Villa, D.A.; Hobbs, C.H. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

The pulmonary toxicity and in vitro cytotoxicity to macrophages of fiberglass insulation and crocidolite asbestos were investigated. Fibers were administered in divided doses to male Syrian hamsters by intratracheal instillation. In vitro cytotoxicity to PAM was greatest for asbestos and lower for commercial fibers. Pulmonary cytotoxicity consisted of proteolysis, cell proliferation, and increased pulmonary collagen related to mass of fibers with a calculated aerodynamic diameter of ≦ 5.0 μm. Fibrosis was present only at 12 months after exposure to asbestos.

19368 (LMF—84, pp 514-516) **Chronic effects of short-term high level aerosol exposures to small experimental microfibers.** Pickrell, J.A. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

Fischer-344 rats were exposed by inhalation to glass fibers for 5 to 6 hours/day for 2 or 5 days and sacrificed at 1, 4.5, 8 and 12 months after initiating exposure. No gross lesions were noted at necropsy. By 8 months, increased tissue alkaline phosphatase in both groups suggested increased tissue cellularity; increased soluble protein suggested an underfined subclinical tissue response. By 12 months, no significant changes were present. Comparison to histologic changes is in progress.

19369 **Clearance by the rat of inhaled fly ash from fluidized-bed coal combustion.** Griffis, L.C.; Snipes, M.B.; Brooks, A.L. (Lovelace Inhalation Toxicology Research Institute, Albuquerque, NM). Contract AC04-76EV01013. *Journal of Toxicology and Environmental Health ;* 7: No. 1, 117-124(Jan 1981).

Fly ash from a fluidized-bed coal combustor was neutron-activated and administered to male Fischer 344 rats by a single nose-only inhalation exposure. The activated fly ash contained ^{46}Sc and smaller amounts of other gamma-emitting radionuclides. Whole-body clearance of radioactivity of 127 d was described by an exponential equation, with the long-term component having a biological half-life of 78 d. High-resolution gamma spectra of the lungs was obtained with a Ge(Li) detector and the relative activities of several fly ash constituents were compared. The activities of ^{152}Eu, ^{134}Cs, ^{54}Mn, and ^{60}Co significantly decreased with time relative to those of ^{46}Sc and ^{59}Fe. These results indicate that the clearance of fly ash is similar to that of other relatively insoluble particles and that some elements may have been preferentially dissolved from the fly ash particles in vivo.

19370 **Health effects investigation of oil shale development.** Griest, W.H.; Guerin, M.R.; Coffin, D.L. (eds.). Ann Arbor, MI; Ann Arbor Science Publishers, Inc. (1981). 266p. (CONF-800680—).

From Symposium on health effects investigations of oil shale development; Gatlinburg, TN, USA (23 Jun 1980).

Environmental and health issues must be addressed as an integral part of synfuels technology development. To this end, the US Environmental Protection Agency, the Department of Energy, Department of Defense (US Navy), the American Petroleum Institute, Development Engineering, Inc., and the Standard Oil Company are cooperating in an interagency matrix approach investigation of the potential health effects associated with the production and refining of shale oil into jet and diesel fuels. Groups of biologists, ecologists, and chemists in laboratories across the nation are involved in this multidisciplinary research effort. This volume is a record of the findings to date as presented at the symposium, Health Effects Investigation of Oil Shale Development, held at Gatlinburg, Tennessee, June 23-24, 1980. The progress summarized here illustrates the success of the matrix approach and suggests that other materials and technologies can be similarly studied. Separate abstracts have been prepared of each item for inclusion in the Energy Data Base.

19371 **Chronic dermal toxicity of Paraho shale oil and distillates.** Holland, J.M. (Oak Ridge National Lab., TN); Gipson, L.C.; Whitaker, M.J.; Stephens, T.J.; Clemmer, G.M.; Wolf, D.A. pp 97-116 of Health effects investigation of oil shale development. Griest, W.H.; Guerin, M.R.; Coffin, D.L.; (eds.). Ann Arbor, MI; Ann Arbor Science Publishers, Inc. (1981).

From Symposium on health effects investigations of oil shale development; Gatlinburg, TN, USA (23 Jun 1980).

The purpose of this experiment was to estimate the relative skin oncogenicity of a Paraho process shale oil and related distillates. A secondary objective was to determine whether materials applied to the skin were absorbed, ingested or possibly inhaled in quantities sufficient to induce systemic toxicity. The results obtained reflect continuous exposure of mice for more than 12 months. Exposures will continue for another 12 months and for this reason the current results should be treated as preliminary pending terminal sacrifice and examination of surviving animals.

19372 **Repair deficient mutant mei-9/sup a/ confers high sensitivity on the test assaying for chemically induced chromosome loss in Drosophila melanogaster.** Zimmering, S. (Brown Univ., Providence, RI). Contract AC02-80EV10421. pp 209-223 of Health effects investigation of oil shale development. Griest, W.H.; Guerin, M.R.; Coffin, D.L. (eds.). Ann Arbor, MI; Ann Arbor Science Publishers, Inc. (1981).

From Symposium on health effects investigations of oil shale development; Gatlinburg, TN, USA (23 Jun 1980).

The purpose of the present paper is to review recent findings by Zimmering and co-workers on a radically improved test for chromosome loss used as an assay to detect induced chromosome lesions. This improved procedure has not only yielded significantly higher frequencies of loss with chemical mutagens inducing lower but detectable levels of loss with conventional tests, but, more critically, has permitted detection of highly significant increases in loss with compounds failing to elicit a positive response in traditional tests even at substantially higher concentrations. The modified test for chromosome loss consists primarily of substituting for an ordinary repair proficient Pl female, a strain of female homozygous for the excision repair mei-9/sup a/ mutant. The rationale for the initial trials with mei-9/sup a/ females derived from the following observations: (a) the hypersensitivity of mei-9/sup a/ larvae to x-ray and uv-induced killing resulting from a defect in repair replication; (b)

the significantly higher rates of spontaneous chromosome breakage/interchange in mei-9/sup a/ somatic cells; (c) the well documented observation that repair systems in the female may influence the steps involved in the finalization of breaks (or pre-break lesions) induced in treated sperm; and (d) direct evidence from this laboratory of a marked potentiation in the ability to detect chromosome lossinduced in the paternal genome by x rays when Pl mei-9/sup a/ females are employed compared with ordinary repair proficient females. Finally, it is of importance to note that the test for chromosome loss requires only an Fl generation, i.e., definitive scoring is made on Fl progeny.

19373 **Structure-activity relationships for insect growth regulators derived from substituted di-tert-butyl phenols.** Walton, B.T.; Sanborn, J.R.; Metcalf, R.L. (Univ. of Illinois, Urbana). *Pesticide Biochemistry and Physiology ;* **12**: 23-30(1979).

Thirty-six para-substituted derivatives of 2,6-di-tert-butyl phenols were synthesized and tested for toxicity to fourth instar larvae of the mosquito Culex quinquefasciatus Say. Toxicities of these compounds ranged from an LC_{50} of 0.004 ppM to $LC_{50} > 10$ ppM. Mosquitoes treated with toxic analogues characteristically died shortly after the pupal molt and appeared to be morphologically normal, untanned pupae. Correlations of insecticidal activity with physicochemical parameters of the para-substituent was found to explain 71.82% of the variation in insecticidal activity expressed as log LC_{50}(mM).

5604 Other Environmental Pollutant Effects

19374 **Fourth national workshop on entrainment and impingement.** Jensen, L.D. (ed.). Melville, NY; EA Communications (1978). 444p. (CONF-771231—).

From 4. workshop on entrainment and impingement; Chicago, IL, USA (5 Dec 1977).

Proceedings of the workshop consist of thirty-six papers and three panel discussions presented in five sections: 316 regulatory issues; entrainment abundance and survival; impingement studies; impact assessment techniques; and engineering aspects of entrainment and impingement. Thirty-two of the papers were abstracted and indexed for EDB. Two of those were also included in ERA. (JGB)

57 HEALTH AND SAFETY

REFER ALSO TO CITATION(S) 19060, 19246

19375 **(DOE/PC/30198—T2) Management implementation plan for a safety analysis and review system.** Hulburt, D.A.; Berkey, B.D. (Hercules, Inc., Cumberland, MD (USA). Allegany Ballistics Lab.). Apr 1981. Contract AC22-80PC30198. 77p. NTIS, PC A05/MF A01.

The US Department of Energy has issued an Order, DOE 5481.1, which establishes uniform requirements for the preparation and review of Safety Analysis for DOE Operations. The Management Implementation Plan specified herein establishes the administrative procedures and technical requirements for implementing DOE 5481.1 to Operations under the cognizance of the Pittsburgh Energy Technology Center. This Implementation Plan is applicable to all present and future Operations under the cognizance of PETC. The Plan identifies those Operations for which DOE 5481.1 is applicable and those Operations for which no further analysis is required because the initial determination and review has concluded that DOE 5481.1 does not apply.

19376 **(EPRI-NP—1731) Ignitability of high-fire-point liquid spills. Final report.** Modak, A.T. (Factory Mutual Research Corp., Norwood, MA (USA)). Mar 1981. 77p. NTIS, PC A05/MF A01.

This work identified the conditions under which a spill of flammable liquid on an ambient-temperature floor could represent a fire threat to grouped cables in an electric utility installation. Five high-fire-point, flammable, hydrocarbon liquids were tested in this program. They were: No. 2 fuel oil, No. 6 residual oil, Mobile DTE 797 turbine lubricating oil, Pennzoil 30-HD motor oil, and Fyrquel 220 hydraulic control fluid. The following floor materials were tested: float-finished (21 MPa) concrete; epoxy-coated (21 MPa) concrete; and steel. The fire hazard presented by a spill depends on the following five factors: spill depth; thermal inertia of the floor under the spill; fire point of the flammable liquid spill; thermal energy available to heat the spill to its fire point; and the availability of an ignition source to ignite the spill after reaching fire point. The relative importance of each factor is identified.

19377 **(PNL—2549(Supp.2)) Supplement to safety analysis report: 306W Building clean room and assembly area.** Kemper, R.S.; McCormack, W.D. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Nov 1980. Contract AC06-76RL01830. 17p. NTIS, PC A02/MF A01.

This supplement to the SAR presents a safety analysis demonstrating the positive differential pressure in the modified space does not increase the risks for operations within the facility.

19378 **(PNL—3749) Safety analysis report for the Hanford Critical Mass Laboratory: Supplement No. 2. Experiments with heterogeneous assemblies.** Gore, B.F.; Davenport, L.C. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Apr 1981. Contract AC06-76RL01830. 60p. NTIS, PC A04/MF A01.

Factors affecting the safety of criticality experiments using heterogeneous assemblies are described and assessed. It is concluded that there is no substantial change in safety from experiments already being routinely performed at the Critical Mass Laboratory (CML), and that laboratory and personnel safety are adequately provided by the combination of engineered and administrative safety limits enforced at the CML. This conclusion is based on the analysis of operational controls, potential hazards, and the consequences of accidents. Contingencies considered that could affect nuclear criticality include manual changes in fuel loadings, water flooding, fire, explosion, loss of services, earthquake, windstorm, and flood. Other potential hazards considered include radiation exposure to personnel, and potential releases within the Assembly Room and outside to the environment. It is concluded that the Maximum Credible Nuclear Burst of 3×10^{18} fissions (which served as the design basis for the CML) is valid for heterogeneous assemblies as well as homogeneous assemblies. This is based upon examination of the results of reactor destructive tests and the results of the SL-1 reactor destructive accident. The production of blast effects which might jeopardize the CML critical assembly room (of thick reinforced concrete) is not considered credible due to the extreme circumstances required to produce blast effects in reactor destructive tests. Consequently, it is concluded that, for experiments with heterogeneous assemblies, the consequences of the Maximum Credible Burst are unchanged from those previously estimated for experiments with homogeneous systems.

19379 **(SAND—76-0438(Rev.)) Guideline for the preparation of safe operating procedures.** Stinnett, L.; Carroll, M.M.; Crooks, D.L.; Doyle, J.R.; Jeblick, H.G.; Kessel, D.S.; Tippy, M.W.; Stuckey, J.M. (Sandia National Labs., Albuquerque, NM (USA)). Mar 1981. Contract AC04-76DP00789. 9p. NTIS, PC A02/MF A01.

These procedures are written for activities that involve the use of explosives, dangerous chemicals, radioactive materials, hazardous sytems, and for certain types of operational facilities which present hazards. This guideline presents a suggested Safe Operating Procedures format.

19380 **(SAND—81-0829) Special Projects Division quarterly progress report, 1 January-31 March 1981.** (Sandia National Labs., Albuquerque, NM (USA)). Apr 1981. Contract AC04-76DP00789. 16p. NTIS, PC A02/MF A01.

This briefing is intended to express the views of the DOE Division of Operational and Environmental Safety (OES) on how the DOE Order 5481.1 is to be interpreted and to offer suggestions for approaches that might be used to implement a program that satisfies the requirements of the Order. The 14th of the 15 guidance documents intended to assist in the implementation of ES and H Assurance Programs was completed in rough draft form this quarter. Volume 7, entitled A Model Plan for Institutional ES and H Assurance Training Programs, has been assembled from previous

briefing materials and from the other 13 guidelines that were previously completed in draft form. At the present time, this training session appears to last on the order of 4 days when used in its entirety. However, the document is being structured to permit selective emphasis to be placed on training, depending upon the persons being trained.

19381 **(UCID—18996) Contingency plan for the Lawrence Livermore National Laboratory's hazardous-waste operations.** Roberts, R.S. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 20 Mar 1981. Contract W-7405-ENG-48. 37p. NTIS, PC A03/MF A01.

The Lawrence Livermore National Laboratory (LLNL) has the necessary equipment and trained personnel to respond to a large number of hazardous material spills and fires or other emergencies resulting from these spills including injured personnel. This response capability is further expanded by the agreements that LLNL has with a number of outside response agencies. The Hazards Control Department at LLNL functions as the central point for coordinating the response of the equipment and personnel. Emergencies involving hazardous waste are also coordinated through the Hazards Control Department, but the equipment and personnel in the Toxic Waste Control Group would be activated for large volume waste pumpouts. Descriptions of response equipment, hazardous waste locations communication systems, and procedures for personnel involved in the emergency are provided.

19382 **(UCRL—52939) Spill exercise 1980: an LLNL emergency training exercise.** Morse, J.L.; Gibson, T.A.; Vance, W.F. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 1 Apr 1981. Contract W-7405-ENG-48. 51p. NTIS, PC A04/MF A01.

An emergency training exercise at Lawrence Livermore National Laboratory (LLNL) demonstrated that off-hours emergency personnel can respond promptly and effecively to an emergency situation involving radiation, hazardous chemicals, and injured persons. The exercise simulated an explosion in a chemistry laboratory and a subsequent toxic-gas release.

58 GEOSCIENCES

5801 Geology And Hydrology

REFER ALSO TO CITATION(S) 17942, 17945, 17969, 18011, 18103, 19183, 19395, 19396, 19419

19383 **(LA—8726-MS) Continental Scientific Drilling Program curatorial needs: a report to the National Academy of Sciences, National Research council, and Continental Scientific Drilling Committee.** Heiken, G.; Goff, S. (Los Alamos Scientific Lab., NM (USA)). Feb 1981. Contract W-7405-ENG-36. 298p. NTIS, PC A13/MF A01.

Cores, cuttings, and other samples produced during the Continental Scientific Drilling Program (CSDP) will be of interest to scientists in many disciplines. In order to circulate and yet protect these samples, some form of curation will be necessary. A uniform policy of curation must be established that addresses who receives the samples, curator's responsibilities, and standard procedures of description and handling of samples. Curators will be responsible for maintaining data files on samples, in cooperation with the CSDP data center and the NOAA-National Geophysical and Solar-Terrestrial Data Center. Through the use of newsletters and trade publications, the existence of these samples must be advertised to stimulate their use. We are recommending that the CSDP establish regional repositories at existing facilities and that the budget for curation be about five per cent of the budget for the total program.

19384 **(LBL—12090) Mechanism of intragranular migration of brine inclusions in salt.** Machiels, A.J.; Yagnik, S.; Olander, D.R.; Kohli, R. (Lawrence Berkeley Lab., CA (USA)). Jan 1981. Contract W-7405-ENG-48. 9p. (CONF-810606—17). NTIS, PC A02/MF A01.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

The dislocation-controlled migration process is qualitatively consistent with all experiments designed to test the hypothesis. It also explains the very large scatter of the measured velocities of small inclusions in crystals of high perfection. Larger inclusions in natural salt crystals, on the other hand, are not limited by the number of dislocation intersections at the dissolving face and these inclusions appear to move at the rate predicted by liquid diffusion control.

19385 **(SAND—80-1645) CONFLOW: a computer code describing flow between two wells in a confined region.** Hertel, E.S. Jr. (Dikewood Corp., Albuquerque, NM (USA)). Apr 1981. Contract AC04-76DP00789. 34p. NTIS, PC A03/MF A01.

The computer code CONFLOW describes fluid flow between two wells in a confined region. The code uses superposition to solve Laplace's equation with impermeable boundaries and can assist in the design of flow experiments in geologic media.

19386 **(SAND—81-0197C) Geohydrology of the proposed waste-isolation pilot-plant site in southeastern New Mexico.** Mercer, J.W.; Gonzalez, D.D. (Geological Survey, Albuquerque, NM (USA); Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 31p. (CONF-810457—1). NTIS, PC A03/MF A01.

From 29. annual meeting of the American Association of Petroleum Geologists; Albuquerque, NM, USA (14 Apr 1981).

The drilling and testing of 30 hydrologic test holes have identified three flow zones above the Salado Formation that could potentially transport wastes to the biosphere if the proposed storage facility were breached. These zones include the contact between the Salado and Rustler formations and the Culebra and Magenta Dolomite Members of the Permian Rustler formation. Potentiometric-surface maps (as equivalent freshwater heads) show flow to the west toward Nash Draw within the Rustler-Salado contact and the Magenta Dolomite Member, and flow to the south within the Culebra Dolomite Member. Determinations of hydraulic gradients, directions of flow, and hydraulic properties have been hindered because of the low permeability of the water-bearing zones. Special techniques in drilling completion and hydraulic testing have been developed to adapt conventional methods to low permeable rock. Calculations from pump, slug, and pressure-pulse tests indicate that transmissivity varies laterally within as well as between the beds. Because groundwater may flow predominantly along fractures, a two-well recirculating test was performed to evaluate the effective porosity and coefficients of dispersivity.

19387 **(UCRL—53095) Uranium-series dating of pedogenic carbonates from the Livermore Valley, California.** Knauss, K.G. (Lawrence Livermore National Lab., CA (USA)). 7 Jan 1981. Contract W-7405-ENG-48. 25p. NTIS, PC A02/MF A01.

A uranium-series dating technique has been applied to pedogenic carbonates from the Livermore Valley in California. The results from geomorphologically distinct Quaternary alluvial units are internally consistent and for one alluvial unit are corroborated by a concordant ^{14}C age for an associated wood fragment. In appropriate situations, age dates for pedogenic carbonates derived using this technique may provide a time stratigraphy for alluvial units and hence provide some limits (minimum age) for last fault movement.

19388 **^{230}Th-^{234}U dating of pedogenic carbonates in gravelly desert soils of Vidal Valley, southeastern California.** Ku, T.L. (Univ. of Southern California, Los Angeles); Bull, W.B.; Freeman, S.T.; Knauss, K.G. *Geological Society of America, Bulletin ;* **90**: No. 2, 1063-1073(Nov 1979).

Radioactive disequilibrium relationships among ^{230}Th, ^{234}U, and ^{238}U can be used to date pedogenic carbonates formed in regions of arid to semiarid climate. Samples suitable for dating consist of dense carbonate rinds around pebbles from the Cca soil horizon. Analytically, the method involves leaching the samples with dilute hydrochloric acid and measuring ^{238}C, ^{234}U, ^{230}Th, and ^{232}Th in both the leachate and residue fractions. As the soil carbonate commonly incorporates silicate mineral-bearing detritus, corrections are made to account for possible introduction of detrital ^{230}Th and ^{234}U into the acid leachate. The corrections are based on the assumptions that the carbonate initially contains negligible amounts of ^{232}Th and ^{230}Th, or has a $^{230}Th/^{232}Th$ ratio similar to that in detri-

tal minerals; ^{238}U, ^{234}U, and ^{230}Th in the detrital silicate phase are in secular equilibrium with each other; and the thorium isotopes in the detrital phase are not fractionated by the acid leaching. Application of the method to calcareous soils developed on upper Quaternary alluvial deposits of the eastern Mojave Desert in southern California gives ages that are internally consistent and that agree with the geomorphic and stratigraphic relative age relationships. Fourteen samples from an upper Pleistocene geomorphic surface, Q2b, yielded an average age of 83,000 +- 10,000 y. This age is confirmed by a different assessment of the data. On one specimen two different layers of a pebble coating were dated, and a carbonate accumulation rate of about 1 mm/8000 y was obtained. 6 figures, 7 tables.

5802 Geophysics

REFER ALSO TO CITATION(S) 17944, 17972, 17973, 19423

19389 **(DOE/ER/70006—7) Operation of a telemetered seismic network on the Alaska Peninsula. Annual report.** (Alaska Univ., Fairbanks (USA). Geophysical Inst.). Feb 1981. Contract AT06-76ER70006. 19p. (RLO—2229-T6-7). NTIS, PC A02/MF A01.

A large aperture network of eleven short period seismic stations is being operated on the Alaska Peninsula and several offshore islands to acquire data for the study of the seismotectonics of a part of the Alaska-Aleutian arc-trench structure. The system operated satisfactorily during the past year and continued to provide seismic coverage at a low magnitude threshold level (M/sub L/ = 2.0). An event detection system, developed under this contract over the past years, has been field installed and is undergoing fine tuning. Focal mechanism studies of intermediate depths Benioff zone earthquakes were continued. Like a previous, smaller set, these mechanisms show predominantly down-dip extension, indicating gravitational sinking of the subducting lithosphere. Analysis of the combined data from our network and a temporary array of Ocean Bottom Seismometers, deployed under a related study, indicate that epicenters of earthquakes in the continental shelf area off Kodiak Island are shifted landward by about 15 km with respect to the epicenters determined from the combined data set. Clusters of shallow seismic activity associated with certain Alaska Peninsula volcanoes, observed over the past years, had previously been interpreted as related to shallow magmatic-geothermal reservoirs. Volcanologic-petrologic field studies conducted last year show that volcanic centers associated with such swarms do indeed have surface manifestations of hydrothermal activity.

19390 **(DOE/ET/44614—T1) Lower Permian facies of the Palo Duro Basin, Texas: depositional systems, shelf-margin evolution, paleogeography, and petroleum potential.** Handford, C.R. (Texas Univ., Austin (USA). Bureau of Economic Geology). 1980. Contract AC97-79ET44614. 35p. NTIS, PC A03/MF A01.

A Palo geological study suggests that potential hydrocarbon reservoirs occur in shelf-margin carbonates, delta-front sandstones, and fan-delta arkoses. Zones of porous (greater than 10 percent) dolomite are concentrated near shelf margins and have configurations similar to productive Lower Permian shelf-margin trends in New Mexico. Delta-front sandstones (log-computed porosity of 18 to 25 percent) are similar to producing deltaic sandstones of Morris Buie-Blaco Fields in North-Central Texas. Porous (18 percent) fan-delta sandstones along the south flank of the Amarillo Uplift may form reservoirs similiar to that of the Mobeetie Field on the north side of the Amarillo Uplife in Wheeler County, Texas. Potential hydrocarbon source beds occur in slope and basinal environments. Total organic carbon generally ranges from 1 to 2.3 percent by weight and averages 0.589 percent by weight.

19391 **(LA—8745-PR) Earthquake catalog for northern New Mexico. Progress report, October 1980-December 1980.** Wechsler, D.J.; Cash, D.J.; Olsen, K.H.; McFarland, N.J.; Wolff, J.J. (Los Alamos National Lab., NM (USA)). Feb 1981. Contract W-7405-ENG-36. 18p. NTIS, PC A02/MF A01.

This report is a summary of the earthquakes in northern New Mexico located by the Los Alamos National Laboratory seismic array. Data are presented in the form of tables and epicenter maps, with a brief explanatory text.

19392 **(LA-UR—81-938) Physical effects in rock under negative effective pressures: sound speeds and hydraulic diffusivity.** Shankland, T.J.; Halleck, P.M. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 7p. (CONF-810624—3). NTIS, PC A02/MF A01.

From 22. US symposium on rock mechanics; Cambridge, MA, USA (29 Jun 1981).

A method for creating negative effective pressure in the laboratory has been developed and longitudinal sound speed and gas diffusivity under these conditions have been measured. The pressure field is created inside an annulus of fluid injection holes in a cylindrical sample; fluid flows radially outward down the pore pressure gradient to the sample's exterior. Pore pressure is monitored through capillary probes and the pressure field is uniform inside the injection ring. With pore fluid pressures to 1.2 MPa, decreases in both acoustic velocity and amplitude in an unconfined sample of fine-grained granite are observed. The velocity decrease is about 1.5% per MPa while amplitude decreases by approximately 10% per MPa. By measuring pressure relaxation after stepwise pore pressure increases, increases in gas diffusivity of approximately a factor of three between 0 and -1 MPa effective pressure are determined.

19393 **(SAND—81-0460) Compression of ground-motion data.** Long, J.W. (Sandia National Labs., Albuquerque, NM (USA)). Apr 1981. Contract AC04-76DP00789. 72p. NTIS, PC A04/MF A01.

Ground motion data has been recorded for many years at Nevada Test Site and is now stored on thousands of digital tapes. The recording format is very inefficient in terms of space on tape. This report outlines a method to compress the data onto a few hundred tapes while maintaining the accuracy of the recording and allowing restoration of any file to the original format for future use. For future digitizing a more efficient format is described and suggested.

19394 **(USGS-OFR—80-302) Hawaiian volcano observatory seismic network history 1950-1979.** Klein, F.W.; Koyanagi, R.Y. (Geological Survey, Menlo Park, CA (USA)). 1980. 104p. Geological Survey, Menlo Park, CA.

The purpose of this report is to assemble information on the growth and recording of the Hawaiian Volcano Observatory's seismic network. It is meant as a guide for those using the seismic records to determine the availability, format, and characteristics of records on a station-by-station basis. This report is intended to be kept up to date with new entries made when stations, their recording, or their characteristics change. The emphasis is on the most recent information (1967 - 1 October 1979), but effort has been made to include some network characteristics back to 1950. This report also includes information on the growth of the network as recording capacity increased. Response curves and calibration factors are given in an attempt to allow users of the data to relate measured amplitudes to ground displacement, at least for data after 1974. Also included is a brief description of scale factors presently in use in setting up network electronics which relates Deelocorder to magnetic tape amplitudes. Detailed descriptions of seismic instrumentation, particularly the variety of types in use before 1970, can be found in several original sources. The information presented here is drawn from these original sources, as well as log books and notebooks maintained by the technical staff.

5803 Mineralogy, Petrology, And Rock Mechanics

REFER ALSO TO CITATION(S) 18010, 18018, 18055, 18097, 19420

19395 **(DOE/ET/44614—T2) Geology and geohydrology of the Palo Duro Basin, Texas Panhandle. Report on the progress of nuclear waste isolation feasibility studies, 1979.** Gustavson, T.C.; Presley, M.W.; Handford, C.R.; Finley, R.J.; Dutton, S.P.; Baumgardner, R.W. Jr.; McGillis, K.A.; Simpkins, W.W. (Texas Univ., Austin (USA). Bureau of Economic Geology). 1980. Contract AC97-79ET44614. 106p. NTIS, PC A06/MF A01.

Since early 1977, the Bureau of Economic Geology has been evaluating several salt-bearing basins within the State of Texas as part of the national nuclear repository program. The Bureau, a research unit of The University of Texas at Austin and the State of Texas, is carrying out a long-term program to gather and interpret all geologic and hydrologic information necessary for description, delineation, and evaluation of salt-bearing strata in the Palo Duro and Dalhart Basins of the Texas Panhandle. The program in FY 79 has been subdivided into four broad research tasks, which are addressed by a basin analysis group, a surface studies group, a geohydrology group, and a host-rock analysis group. The basin analysis group has delineated the structural and stratigraphic framework of the basins, initiated natural resource assessment, and integrated data from 8000 ft (2400 m) of core material into salt-stratigraphy models. Salt depth and thickness have been delineated for seven salt-bearing stratigraphic units. Concurrently, the surface studies group has collected ground and remotely sensed data to describe surficial processes, including salt solution, slope retreat/erosion mechanisms, geomorphic evolution, and fracture system development. The basin geohydrology group has begun evaluating both shallow and deep fluid circulation within the basins. The newly formed host-rock analysis group has initiated study of cores from two drilling sites for analysis of salt and the various lithologies overlying and interbedded with salt units. This paper, a summary report of progress in FY 79, presents principal conclusions and reviews methods used and types of data and maps generated.

19396 **(DOE/OR/05466—T1) Geology and geohydrology of the Palo Duro Basin, Texas Panhandle. Report on the progress of nuclear waste isolation feasibility studies, 1978.** Dutton, S.P.; Finley, R.J.; Galloway, W.E.; Gustavson, T.C.; Handford, C.R.; Presley, M.W. (Texas Univ., Austin (USA). Bureau of Economic Geology). 1979. Contract AS05-77OR05466. 105p. (ORO—5466-10). NTIS, PC A06/MF A01.

Early in 1977 the Bureau of Economic Geology was invited to assemble and evaluate geologic data on several salt-bearing basins within the State of Texas as a contribution to the national nuclear repository program. In response to this request, the Bureau, acting as a technical research unit of the University of Texas at Austin and the State of Texas, initiated a long-term program to assemble and interpret all geologic and hydrologic information necessary for delineation, description, and evaluation of salt-bearing strata in the Panhandle area. The technical program can be subdivided into three broad research tasks, which are addressed by a basin analysis group, a surface studies group, and a basin geohydrology group. The basin analysis group has assembled the regional stratigraphic and structural framework of the total basin fill, initiated evaluation of natural resources, and selected stratigraphic core sites for sampling the salt and associated beds. Two drilling sites have provided nearly 8000 feet (2400 m) of core material for analysis and testing of the various lithologies overlying and interbedded with salt units. Concurrently, the surface studies group has collected ground and remotely-sensed data to describe surficial processes, including carbonate and evaporate solution, geomorphic evolution, and fracture system development. The newly formed basin geohydrology group will evaluate both shallow and deep circulation of fluids within the basins. This paper, a summary report of progress, reviews principal conclusions and illustrates the methodologies used and the types of data and displays generated.

19397 **(LA—8770-MS) Comparison of methods for calculation of recommended elemental concentrations for Canadian Certified Reference Materials Project rock standards SY-2, SY-3, and MRG-1.** Gladney, E.S. (Los Alamos Scientific Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 8p. NTIS, PC A02/MF A01.

Recommended elemental concentrations for rock standards SY-2, SY-3, and MRG-1 have been recalculated using standard statistical methods. These values are compared with those determined by the Geological Survey of Canada using their select laboratories method.

19398 **(LA-UR—81-887) Effect of anisotropy in explosive fragmentation.** Dienes, J.K. (Los Alamos National Lab., NM (USA)). 1981. Contract W-74905-ENG-36. 9p. (CONF-810624—1). NTIS, PC A02/MF A01.

From 22. US symposium on rock mechanics; Cambridge, MA, USA (29 Jun 1981).

The behavior of rocks at large deformations is characterized, including the effects of crack growth when unstable, the effects of anisotropy, the distinction between open and closed cracks, the influence of crack intersections, the role of pore pressure, and a calculation of permeability. The theory is quite general, and is intended for use in a computer program rather than as a vehicle for obtaining analytic results. When a spherical explosive charge is embedded in oil shale it produces an aspirin-shaped cavity at late times as a result of the bedded structure of the rock. In this paper a calculation of the cavity produced by a spherical explosive is compared with a radiograph, showing remarkable agreement between the two. The shape of the cavity is explained by the behavior of cracks lying in the bedding planes.

19399 **(LBL—8674) Laboratory assessment of the use of borehole pressure transients to measure the permeability of fractured rock masses.** Forster, C.B.; Gale, J.E. (Waterloo Univ., Ontario (Canada). Dept. of Earth Sciences). Sep 1980. Contract W-7405-ENG-48. 109p. (SAC—28). NTIS, PC A06/MF A01.

A laboratory program is described that was designed (1) to evaluate the degree of correlation between permeability values determined from steady-state and transient tests on the same samples and (2) to determine the effects of packer compliance on pressure pulse tests performed on low permeability rocks. The basic theory of pressure pulse testing is reviewed and modifications are proposed that may account for packer compliance effects. The laboratory setup simulates a full-scale field situation using standard field packers in a 76 mm steel pipe. Cylindrical samples 5 cm in diameter and 11 cm long can be subjected to hydrostatic confining pressure up to 34 MPa and pore pressures up to 10 MPa. Using this equipment, transient pressure pulse tests and stead-state flow tests have been performed on (1) two samples of Berea sandstone having conductivities of 6.1×10^{-5} cm/sec and 2.4×10^{-4} cm/sec. and (2) one sample of Stripa granite containing a single fracture parallel to the core axis. Flow through the fracture varied from 1.0 to 0.05 cm^3/min when the confining pressure varied from about 3 MPa to 14 MPa for pressure differentials of 0.14 MPa. Transient tests on the porous media samples consistently gave lower permeability values than steady-state tests on the same samples. All samples showed distinct compliance effects that increased with decreasing permeability. The laboratory results demonstrated that transient tests are very sensitive to minor leaks in the test assembly and to temperature variations as slight as +- 0.05°C in the cavity fluid. Thus pressure-pulse borehole equipment must be carefully checked in full-scale test assemblies and must incorporate temperature measuring devices that can detect changes of +- 0.01°C.

19400 **(LBL—11895) Measurement of in-situ stress in salt and rock using NQR techniques.** Schempp, E.; Hirschfeld, T.; Klainer, S. (Lawrence Berkeley Lab., CA (USA)). 1 Dec 1980. Contract W-7405-ENG-48. 165p. NTIS, PC A08/MF A01.

A discussion of how stress and strain affect the quantities which can be measured in an NQR experiment shows that, for stresses of the magnitude to be expected at depths up to about 10,000 feet, quadrupole coupling constants will fall in the range of 1 to 10 kHz for both the sodium and chloride ions in NaCl. The most promising system involves pulsed nuclear double resonance detection; and alterative is to observe the quadrupolar splitting of the NMR signal. Choices to be made in the measurement and mapping techniques are discussed. The well-known perturbation of the homogenous stress field in the neighborhood of a borehole is shown to be advantageous from the point of view of obtaining directional information on the stress. Construction and operation of a borehole stress sensor are considered. The NQR technique seems feasible for measuring the magnitude and direction of underground stress with a resolution of about 25 psi, or 2.5% at 1000 psi. Downhole instrumentation suitable for in-situ determinations of stress appears within the state of the art. Additional tasks required on the project are identified.

19401 **(RHO-BWI-C—91) Thermal/mechanical properties of Pomona and Umtanum basalts: elevated temperature comparative triaxial test.** (Foundation Sciences, Inc., Portland, OR (USA)). Dec 1980. Contract AC06-77RL01030. 89p. NTIS, PC A05/MF A01.

The thermomechanical behavior of Umtanum and Pomona basalt cores from the Hanford Site near Richland, Washington, is investigated. The objective of this study is to provide information relating conditions within the Pomona flow at the Near-Surface Test Facility (NSTF) to projected repository conditions within the Umtanum flow. This project included experiments to measure bulk and grain density, apparent porosity, static and dynamic elastic constants, and compressive strength under triaxial loading. All tests were performed in accordance with Rockwell-approved test procedures. In addition to comparing the properties of Umtanum and Pomona basalts, the triaxial compression test is designed to provide data for comparing the effects of heating specimens in unconfined and confined conditions and for comparing the properties of jointed and unjointed specimens. The complete testing program is outlined. All specimens were grouped in pairs. One specimen from each pair was heated to 200°C before applying the confining pressure. For the other member of the pair, the confining pressure was applied first. Intact Umtanum specimens were not available so no specimens are listed in the intact classification.

19402 **(RHO-BWI-C—92) Thermal/mechanical properties of umtanum basalt: Borehole DC-2.** Feves, M.L.; Cooper, J.D. (Foundation Sciences, Inc., Portland, OR (USA)). Jan 1981. Contract AC06-77RL01030. 130p. NTIS, PC A07/MF A01.

The thermal/mechanical behavior of basalt cores from the Near-Surface Test Facility (NSTF) at Gable Mountain and from Borehole DC-2 on the Hanford Site is being studied to help understand the results of the in situ testing at the NSTF, and to provide information relating NSTF conditions within Pomona basalt to projected repository conditions within Umtanum basalt. This report describes the thermal/mechanical properties of Umtanum basalt from Borehole DC-2. Reported are: thermal expansion, static and dynamic elastic properties, compressive strength, Brazilian tensile strength, modulus of rupture, density, apparent porosity, thermal conductivity, specific heat, and thermal diffusivity. (DLC)

19403 **(SAND—81-7073) In situ permeability testing of rock salt.** Peterson, E.W.; Lagus, P.L.; Broce, R.D.; Lie, K. (Sandia National Labs., Albuquerque, NM (USA)). Apr 1981. Contract AC04-76DP00789. 71p. NTIS, PC A04/MF A01.

Storage of transuranic (TRU) wastes in bedded salt formations requires a knowledge of the in situ permeability of SENM rock salt. Since assumptions for safety assessments have been made in which these wastes could generate gas pressures on the order of the lithostatic pressure over geologic time scales, the permeability of the surrounding formation becomes an important parameter for determining the manner in which the gases will be contained or dispersed. This report describes the series of tests conducted in the AEC-7 borehole, located near the WIPP site, to determine the in situ gas flow characteristics of the bedded salt. In these tests, compressed air was injected into the borehole and flow into the surrounding formation measured. These measured flow rates were interpreted in terms of formation permeabilities and porosities which were, in turn, used as modeling parameters for the repository response analysis. Two series of field tests were performed. The first series consisted of a number of whole-hole flow tests conducted to provide preliminary design information required for future operation of a guarded straddle packer system capable of measuring permeabilities > or = 0.1 μdarcy. The second series of tests were conducted using the Systems, Science and Software (S-Cubed) designed guarded straddle packer system. In these interval permeability tests, 100-foot lengths of borehole were isolated and the flow characteristics of the surrounding formation examined. In this report, a complete description of the test procedures, instrumentation, and measurement techniques is first given. The analytical/numerical methods used for data interpretation are then presented, followed by results of the interval and permeability tests. (The whole-hole tests are summarized in Appendix A.) Conclusions are presented in the final section.

19404 **(UCRL—53076) In situ geomechanics: Climax granite, Nevada Test Site.** Heuze, F.E.; Patrick, W.C.; De la Cruz, R.V.; Voss, C.F. (Lawrence Livermore National Lab., CA (USA)). Apr 1981. Contract W-7405-ENG-48. 68p. NTIS, PC A04/MF A01.

The in situ modulus of the Climax granite in the Spent Fuel Test (SFT-C) area of the Nevada Test Site was estimated using six different approaches. Our best estimate of field modulus as E/sub f/ = 26 GPa was obtained from a comparison of the various approaches. A best estimate of laboratory modulus acquired by comparing three different sources was E/sub l/ = 70 GPa. Therefore, the modulus reduction factor for the Climax granite appears to be E/sub f//E/sub l/ = 0.37. In turn, our estimate of in situ rock-mass deformability was used to back-calculate in situ values for the normal stiffness of the granite joints. Our analysis of former stress measurements by the US Geological Survey (USGS) shows that the horizontal stresses in the vicinity of SFT-C vary greatly with azimuth. An unexplained feature of the stresses at SFT-C is the fact that the vertical stress appears to be only 65 to 75% of the calculated lithostatic burden. From the three-dimensional stress ellipsoid at mid-length in the tunnels, assuming a plane strain condition, we were able to estimate an in situ Poisson's ratio of the rock mass as $\nu = 0.246$. Two other techniques were applied in an attempt to measure the stresses around the SFT-C heater and canister drifts: the undercoring method and the borehole jack fracturing approach. The former technique appears to have given reasonable estimates of tangential stresses in the roof of the heater drifts; the latter appears to give low results for stresses in the pillars. Specific recommendations are made for future tests to further characterize the mechanical properties of the Climax granite and the in situ stresses at SFT-C.

19405 **(UCRL—53113) Equations of state of $CaCO_3$ and its mixtures with H_2O.** Ree, F.H. (Lawrence Livermore National Lab., CA (USA)). 19 Mar 1981. Contract W-7405-ENG-48. 47p. NTIS, PC A03/MF A01.

A new multiphase equation of state (EOS) of the calcium carbonate ($CaCO_3$) system has been developed by combining several theoretical models that describe different physical processes over various ranges of density and temperature. The new EOS data cover densities between 1×10^{-6} and 1×10^{3} Mg/m^3 and temperatures between 2.5×10^{-2} and 2.5×10^{4} eV. We describe several physical features of the new data. We have also developed equations of state of $CaCO_3 + H_2O$ mixtures for realistic computer simulations of surface and underground nuclear explosions of different yields. To tabulate equations of state for three mixtures containing different concentrations of water at densities between 10^{-5} and 360 Mg/m^3 and temperatures between 0.025 and 25000 eV, we used an improved mixture model based on our earlier EOS data of water and the EOS data of $CaCO_3$ described in this work. We have used these data to compute theoretical Hugoniots and isentropic release paths.

19406 **(UCRL—85285) Effects of pressure and temperature on the thermal properties of a salt and a quartz monzonite.** Durham, W.B.; Abey, A.E. (Lawrence Livermore National Lab., CA (USA)). 27 Mar 1981. Contract W-7405-ENG-48. 9p. (CONF-810624—5). NTIS, PC A02/MF A01.

From 22. US symposium on rock mechanics; Cambridge, MA, USA (29 Jun 1981).

Measurements have been made of thermal conductivity, diffusivity, and linear expansion as a function of temperature (to 573 K) and hydrostatic pressure (to 50 MPa) on two rocks, Avery Island domal salt and Climax Stock quartz monzonite. For Avery Island salt the thermal properties do not show any pressure dependence and are approximately the same values as for single crystal halite at 0.1 MPa. The lack of pressure dependence is attributed to the high symmetry of halite (cubic) and to its low strength, both of which inhibit brittle fracturing. For Climax Stock quartz monzonite no pressure dependence of thermal diffusivity has been resolved, but conductivity does show a drop of approximately 10% with decreasing pressure from 50 to 3 MPa. The pressure dependence is not measurably altered by heating the rock to as high as 473 K under 50 MPa. Our measurements so far on the thermal conductivity of quartz monzonite vs temperature and pressure are in agreement with predictions of the Walsh and Decker (1966) model of thermal conductivity vs crack porosity based on independent meas-

urements of crack porosity vs temperature and pressure for the same quartz monzonite. Heating to temperatures greater than 473 K at 50 MPa, or heating to lower temperatures at lower pressures, should substantially reduce thermal conductivity of the quart monzonite.

19407 **(UCRL—85736) Elastic moduli, thermal expansion, and inferred permeability of Climax quartz monzonite and Sudbury gabbro to 500°C and 55 MPa.** Page, L.; Heard, H.C. (Lawrence Livermore National Lab., CA (USA)). 17 Mar 1981. Contract W-7405-ENG-48. 11p. (CONF-810624—2). NTIS, PC A02/MF A01.

From 22. US symposium on rock mechanics; Cambridge, MA, USA (29 Jun 1981).

Young's modulus (E), bulk modulus (K), and the coefficient of thermal linear expansion (α) have been determined for Climax quartz monzonite to 500°C and pressures (P) to 55 MPa and for Sudbury gabbro to 300°C and 55 MPa. For each rock, both E and K decreased with T and increased with P in a nonlinear manner. In the monzonite, E and K decreased by up to 60% as P decreased from 55.2 to 6.9 MPa isothermally, while the gabbro indicated a decrease up to 70% over the same pressure range. As T increased isobarically, E and K for the monzonite decreased by up to a factor of ~ 80% from 19 to 500°C. The moduli of the gabbro decreased by as much as 70% from 19 to 300°C. α for the monzonite increased with T and decreased with P in a nonmonotonic fashion, with most measured values for α greater than values calculated for the crack-free aggregate. Depending on P, α in the monzonite increased from 8 to 11.10^{-6} °C^{-1} at 40°C to 22 to $25.10^{-6}C^{-1}$ at 475°C. For the gabbro, α also generally decreased with increasing P. Values ranged from 6 to 11.10^{-6} °C^{-1}, showing a nonlinear trend and very little net increas over the T range from 19 to 300°C. Calculated permeability of these rocks based on the α determinations indicated that permeabilities may increase by up to a factor of 3 over the temperature interval 19 to 300°C, and the permeability of the monzonite is inferred to increase by up to a factor of 8 by 500°C. In both rocks, most measurements are consistent with microcracks controlling the thermoelastic response by opening with T and closing with σ and P.

19408 **(UCRL—85871) Analysis of bolt reinforcement in rock slopes.** Heuze, F.E. (California Univ., Livermore (USA). Lawrence Livermore Lab.). Apr 1981. Contract W-7405-ENG-48. 9p. (CONF-810633—1). NTIS, PC A02/MF A01.

From 3. international conference on stability in surface mining; Vancouver, BC, Canada (1 Jun 1981).

The modeling of bolt reinforcement in rock slopes is discussed. The shear strength of rough-surfaced rock joints is related to the amount of dilation possible in the joint. By bolting the joint and restraining dilation, shear strength is greatly increased. An application of the model to a rock slope containing a joint is presented. (ACR)

19409 **Plane shock wave studies of Westerly granite and Nugget sandstone.** Larson, D.B.; Anderson, G.D. (Univ. of California, Livermore). Contract W-7405-ENG-48. *International Journal of Rock Mechanics and Mining Sciences and Geomechanics Abstracts ;* **17**: No. 6, 357-363(Dec 1980).

Plane shock wave experiments were performed by using a light-gas gun on dry and water-saturated Westerly granite and dry Nugget sandstone. Changes in the slopes of the shock velocity versus particle velocity curves at 2 to 3 GPa and 1 to 2 GPa for dry granite and for dry sandstone, respectively, are attributed to the onset of pore collapse. However, there is little apparent loss of shear strength in either dry rock over the stress range of the experiments (i.e., 9.3 GPa in Westerly granite and 9.2 GPa in Nugget sandstone). Agreement between the shock wave data and quasistatic, uniaxial strain data for the dry rock implies the absence of rate-dependence in uniaxial strain. The shock data on saturated granite agree well with those for dry granite, thus suggesting there was no loss in shear strength as a result of pore pressure buildup.

19410 **(DOE/EV/70134—T3) Carbon and oxygen isotopes in apatite CO_2 and co-existing calcite.** Kolodny, Y.; Kaplan, I.R. (California Univ., Los Angeles (USA). Dept. of Geology). [nd]. Contract AT03-76EV70134. 29p. NTIS, PC A03/MF A01.

Carbon and oxygen isotopes were analyzed in carbonate apatite CO_2 and in co-existing calcite. Both C and O in apatite CO_2 are enriched in the respective light isotopes relative to calcite. These results confirm the proposition that carbonate is part of the apatite structure.

5804 Geochemistry

19411 **(DOE/EV/00890—T3) Geochemistry of ^{210}Pb in the southeastern, US estuarine system.** Storti, F.W. (Georgia Inst. of Tech., Atlanta (USA)). Nov 1980. Contract AS09-76EV00890. 51p. NTIS, PC A04/MF A01.

Thesis.

This study was an attempt to determine the geochemical behavior of ^{210}Pb in southeastern salt marsh estuaries. As a part of this study the ^{210}Pb dating technique was applied to natural and anthropogenic deposits of the region. ^{210}Pb activity of sediment and water from the Georgia coastal area was measured by alpha spectroscopy. The effects of grain size and carbon content of the sediment on ^{210}Pb concentrations was evaluated and the activity of ^{210}Pb in dissolved and particulate phases of rivers was measured as a function of salinity. Ages and sedimentation rates of sedimentary deposits were also determined for some deposits. ^{210}Pb activity in dissolved and particulate phases of rivers showed no clear trends as functions of salinity. River particulate activities were three to four times higher than dissolved activities. The relationship between ^{210}Pb activity in salt marsh sediments and grain size was highly significant. Direct application of the ^{210}Pb method to date and determine sedimentation rates of natural and anthropogenic deposits was partially successful. The anthropogenic deposits, however, had to be dated on the basis of normalizing ^{210}Pb activities to grain size (% silt and clay) and carbon content (% carbon).

19412 **(UCRL—52990) National Uranium Resource Evaluation Program: the Hydrogeochemical Stream Sediment Reconnaissance Program at LLNL.** Higgins, G.H. (Lawrence Livermore National Lab., CA (USA)). Aug 1980. Contract W-7405-ENG-48. 27p. NTIS, PC A03/MF A01.

From early 1975 to mid 1979, Lawrence Livermore National Laboratory (LLNL) participated in the Hydrogeochemical Stream Sediment Reconnaissance (HSSR), part of the National Uranium Resource Evaluation (NURE) program sponsored by the Department of Energy (DOE). The Laboratory was initially responsible for collecting, analyzing, and evaluating sediment and water samples from approximately 200,000 sites in seven western states. Eventually, however, the NURE program redefined its sampling priorities, objectives, schedules, and budgets, with the increasingly obvious result that LLNL objectives and methodologies were not compatible with those of the NURE program office, and the LLNL geochemical studies were not relevant to the program goal. The LLNL portion of the HSSR program was consequently terminated, and all work was suspended by June 1979. Of the 38,000 sites sampled, 30,000 were analyzed by instrumental neutron activation analyses (INAA), delayed neutron counting (DNC), optical emission spectroscopy (OES), and automated chloride-sulfate analyses (SC). Data from about 13,000 sites have been formally reported. From each site, analyses were published of about 30 of the 60 elements observed. Uranium mineralization has been identified at several places which were previously not recognized as potential uranium source areas, and a number of other geochemical anomalies were discovered.

5805 Oceanography

19413 **(DOE/EV/75026—94) Hydrographic and biological observations on the Washington continental shelf and slope during the periods: 30 March-5 April, 8-15 June, and 6-11 September 1978.** Postel, J.R.; Peterson, W.K. (comps.). (Washington Univ., Seattle (USA). Dept. of Oceanography). Jan 1981. Contract AT06-76EV75026. 189p. NTIS, PC A09/MF A01.

During 1978 several cruises were successfully completed along a shelf-slope section off the Washington coast. These cruises were undertaken to collect seasonal information on the processes affecting phytoplankton production and distribution and data on the settling rate of organic matter in the sea during spring, early summer, and autumn conditions. This report summarizes the data collected on three cruises aboard the R/V CAYUSE, which was operated by Oregon State University. All three cruises originated and terminated in Newport, Oregon. Sampling was conducted at established station locations along a transect off Copalis Beach, Washington. Water depth varied from about 10 m at the innermost station (~ 3 km from the beach) to over 1500 m at the outermost station (~ 120 km from the beach).

19414 **(SAND—80-1776) Proceedings of a workshop on physical oceanography related to the subseabed disposal of high-level nuclear waste.** Marietta, M.G. (ed.). (Sandia National Labs., Albuquerque, NM (USA)). Apr 1981. Contract AC04-76DP00789. 308p. (CONF-800161—). NTIS, PC A14/MF A01.

From Workshop on physical oceanography related to the subseabed disposal of high-level nuclear waste; Big Sky, MT, USA (14 Jan 1980).

At this workshop a group of expert scientists: (1) assessed the current state of knowledge with regard to the physical oceanographic questions that must be answered generally if high level nuclear waste is to be disposed of on or under the seabed; (2) discussed physical oceanographic science necessarily related to the US Subseabed Disposal Program; (3) recommended necessary research; and (4) identified other ongoing programs with which important liaisons should be made and continued. This report is a collection of workshop presentations, and recommendations, and a synthesis of topical group recommendations into a unified statement of research needs. The US Seabed Disposal Program is described. The goal is to assess the technical, environmental and engineering feasibility of seabed disposal. The environmental studies program will assess possible ecosystem and health effects from radionuclides which may be released due to accidental leakage. Discussion on the following topics are also included: bottom boundary layer; mixing across isopycnal surfaces; circulation modeling; mesoscale dispersion; deep circulation of the Pacific Ocean; vertical transport at edges; instrumentation; chemical oceanography; plutonium distribution in the Pacific; biology report; chemical dumping report; and low-level waste report.

19415 (SAND—80-2577(Vol.2)(Pt.2), pp 7-30) **Appendix P: analysis of geological and geophysical data in selected areas of the North Pacific.** Hayes, D.E.; Damuth, J.E.; Jacobi, R.D. Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 2 of 2.

During 1979 we initiated a comprehensive assessment of existing marine geological and geophysical data for the northwest Pacific (PAC 1; 20° to 50°N; 145° to 180°E). The purpose of these studies is to locate, if possible, several 1° x 1° (latitude x longitude) areas which may qualify as candidate waste-disposal sites. Some of these 1° x 1° sites will then be surveyed in detail on future cruises. We have examined all 3.5 and 12 kHz echogram data through the PAC 1 area contained in the Lamont-Doherty, Scripps, and Univ. of Hawaii echogram libraries. These data comprise the vast majority of data that exist for the northwest Pacific. Using these data we were able to classify and map the distribution of various types of microtopography and acoustic reflectivity (echo character) throughout the PAC 1 area. These studies revealed (1) the nature of stratification in the upper 25 to 100 m of the sea floor; (2) nature of the microtopography of the sea floor and areal distribution of basement outcrops; (3) locations of areas affected by bottom currents and mass-wasting process. We have also compiled and evaluated all D.S.D.P. drilling information and L-DGO piston core, bottom camera, heat-flow, sonobuoy, and low frequency seismic-reflection data for the PAC 1 area. We are continuing to compile additional acoustic and station data from other sources including US Navy, NOAA, Japan, and N.G.S.D.C., DMA. Our studies in the PAC 1 area to date have enabled us to locate at least 10 1° x 1° areas which appear to be potentially suitable sites for further waste disposal studies. Three of these potential sites will be surveyed in detail on an upcoming VEMA cruise in spring 1980. Remaining areas will be surveyed during future cruises.

19416 (SAND—80-2577(Vol.2)(Pt.2), pp 31-186) **Appendix Q: site survey and assessment and multibarrier identification and quantification, 1979.** Heath, G.R. (Oregon State Univ., Corvallis); Leinen, M.; Epstein, G.B. Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 2 of 2.

Studies of the geochemistry of sediment cores from North Pacific study areas MPG-I and II show excellent correlations of variations in the influx of detrital, biogenic, hydrothermal, and hydrogenous material spanning the past 65 million years. This evidence of very long-term lateral coherence over a distance of more than 720 km confirms our earlier conclusions as to the uniformity and predictability of deposition in the mid-ocean pelagic clay environment. Sorption experiments show that pH changes from 1.4 to 8 produce about a 6-fold change in Kp for Eu; comparable to the change due to an order of magnitude change in dissolved Eu concentration. Also, isotopic exchange of Eu is rapid on pelagic sediments. Finally, Eu at low concentrations has Kp values in seawater comparable to those in 0.7M NaCl. Work on ion migration in undisturbed deep-sea sediments shows Kd values for Ra-226 of 10^3 to 10^4 in sediments, but up to 10^7 in manganese nodules. Kd values for Th-230 and Pa-231 in manganese nodules are roughly 10^9 the consistency of batch and column sorption data and observations of diffusion in nature confirm the effectiveness of deep-sea red clay as a barrier to cation migration.

19417 (SAND—80-2577(Vol.2)(Pt.2), pp 187-212) **Appendix Q: siting considerations for submarine geologic disposal of nuclear waste.** Hollister, C.D.; Corliss, B.H. Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 2 of 2.

Site suitability characteristics of submarine geological formations for the disposal of radioactive wastes include the distribution coefficient of the host medium, permeability, viscoelastic nature of the sediments, influence of organic material on remobilization, and effects of thermal stress. The submarine geological formation that appears to best satisfy these criteria is abyssal red clay. Regions in the ocean that have coarse grained deposits, high or variable thermal conductivity, high organic carbon content, and sediment thickness of less than 50 m are not being considered at this time. The optimum geological environment should be tranquil and have environmental predictability over a minimum of 10^8 years. A paleoenvironmental model of Cenozoic sedimentation in the central North Pacific has been constructed from sedimentological, geotechnical and stratigraphic data derived from a single giant piston core collected in the central North Pacific (GPC-3: 30°N, 157°W; 5705 m). This core represents a record of nearly continuous sedimentation for nearly 70 million years. The core was taken from a region of abyssal hill topography located beneath the present-day carbonate compensation depth. It contains 24.5 meters of undisturbed sediment composed of oxidized brown clay with altered ash layers. Paleomagnetic stratigraphy for the upper 4.5 meters indicates sedimentation rates are 2.5 mm/1000 years for the last 2 m.y. and 1.1 mm/1000 years before that to 2.4 Ma. Ichthyolith stratigraphy shows sedimentation rates of 0.2 to 0.3 mm/1000 years from 65 to 5 Ma. The observed sedimentological variations can be explained in terms of present sedimentation patterns in the central North Pacific and by the NNW motion of the Pacific plate during the Cenozoic.

19418 (SAND—80-2577(Vol.2)(Pt.2), pp 213-218) **Appendix S: assessment of North Atlantic sea-bed regions for radioactive waste disposal.** Tucholke, B.E. Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 2 of 2.

We currently are assembling and analyzing available geological and geophysical data for one area in the eastern North Atlantic and two areas in the western North Atlantic. In the eastern North Atlantic seismic profiler and DSDP drillsite data is being used to

assess the sediment thickness, vertical and lateral coherence of beds, basement depth, and basement structure. Similar analysis has been largely completed for the western North Atlantic areas, and analysis of near-seafloor sediment facies, heat flow, bottom photographs, nepheloid-layer character, and selected grain-size and carbonate analyses is continuing.

19419 (SAND—80-2577(Vol.2)(Pt.2), pp 219-394) **Appendix T: subseabed disposal program site qualification activities.** Laine, E.P.; Fisher, J.; Lindquist, N.; Ayer, E.; Chipello, P.; Prince, R. Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 2 of 2.

Efforts have been concentrated in 5 distinct areas during the past year. These include: (1) preparation of a Site Selection/Qualification Program Plan; (2) Coordinating Subseabed and Office of Nuclear Waste Isolation (ONWI) site selection models; (3) cooperation with the European efforts in the eastern North Atlantic; (4) completion of analysis of field data from MPG-3N; and (5) initiation of a minor program to determine the suitability of distal turbidites of the Sohm Abyssal Plain for shallow disposal. Brief descriptions of each of these projects are presented. Supporting documents and tabulations of data from MPG-3N are contained in the appendices. (DMC)

19420 (SAND—80-2577(Vol.2)(Pt.2), pp 621-634) **Appendix AA: constitutive properties and model development for marine sediments in support of the subseabed waste disposal program.** Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 2 of 2.

The Geomechanics Division, Structures Laboratory, of the US Army Engineer Waterways Experiment Station (WES) was tasked by the Sandia Laboratories (SLA) in June 1979 to develop and submit a program plan to conduct research on the high-pressure dynamic properties of seabed sediments and to participate in the formulation of mathematical constitutive models for such materials using effective stress concepts. The proposed work consisted of two parts. Part I deals with the development of a mathematical constitutive model and the associated numerical algorithms for the seabed sediments. Part II is concerned with laboratory testing of the seabed sediments. The purpose of this report is to document the status of the work as of 31 December 1979. During this period (a) the basic constitutive model was formulated and (b) illite samples consisting of twenty 2-in. by 4-in. remolded samples and four 4-in. undisturbed samples were obtained from the University of Rhode Island and SLA for future testing. The samples are submerged in salt water and are stored in a cooler at a temperature of approximately 4°C. Formulation of the constitutive model is given in the next section.

19421 (SAND—80-2577(Vol.2)(Pt.2), pp 635-698) **Appendix BB: long coring facility (LCF).** Driscoll, A.H.; Silva, A.J. Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 2 of 2.

During the 1979 performance period the Engineering Design of the Long Coring Facility has addressed a variety of tasks relating to the establishment of a series of operating parameters for a conceptual 50 meter long coring system. The results of these efforts have indicated that an operational system capable of the recovery of 50 meter long cores, from oceanic depths in sediments of 400 gm cm^2 is wholly possible given existing technology. Specific tasks included in the 1979 Engineering Design are as follows: (1) Hydrodynamic Stability; (2) Corer Structural Stability; (3) Corer Penetration Mechanics; (4) Anticipated Corer Pullout forces; (5) LCF Cable Dynamics; and (6) Core Head Instrumentation. Within the realm of Subseabed Disposal Programs Master Plan the LCF, as a part of the Instrumentation Development activity, is currently on schedule. Delays in receiving funding during 1979 have reduced, some what, the latitude enjoyed by the LCF project and have limited our progress to a point where any future delay can result in the LCF's falling behind the program schedule. However, at this time the LCF is considered to be on schedule, but lacking in flexibility to respond to any major contingency that may arise in the future.

19422 (SAND—80-2577(Vol.2)(Pt.2), pp 699-718) **Appendix CC: tripod modification of sphincter corer - construction, operation, core extrusion, and sampling efficiency.** Burke, J.C.; Hamblin, R.E.; Casso, S.A. Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 2 of 2.

A 21-cm diameter sphincter corer (Burke 1968) has been modified by mounting it in a tripod frame. This modification results in more dependable recovery of undisturbed surficial sediment and greater penetration into firm sediment. The device is useful in water depths from 2-6000 m, is adaptable for use on small boats, is very easily employed on large research vessels and can be readily disassembled for more convenient transporting and storing.

19423 (SAND—80-2577(Vol.2)(Pt.2), pp 719-740) **Appendix DD: assessment of seabed seismic systems.** Bunce, E.T. Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 2 of 2.

This project was initiated to accomplish the necessary research and documentation of existing seismic techniques and systems for the study of sediments and sedimentary structures in the oceans. In this respect, it is an inventory of methods and techniques for looking at small-scale features or changes in structures lying from 10 to 1000 m beneath the sea floor. It attempts to assess the vertical and lateral resolution capabilities of existing and technically feasible seismic systems. Some of the questions posed are: how closely can we determine vertical variation such as sediment layer thickness and vertical variation with depth; also lateral coherence or its disruption by such agents as facies changes, thinning or thickening, slumping, faulting; the nature of the basement structure, its areal coherence, velocity structure and associated anomalies? The rationale lies in the growing need to dispose effectively of high level radioactive waste, that such disposal will be beneath the sea floor, and of course in conformity with present guidelines. In the event that such a decision is made, the necessity exists for establishing criteria for site selection and then for intensive study of such site or sites using suitable seismic-acoustic techniques either presently available or capable of development.

64 PHYSICS RESEARCH

6401 Astrophysics And Cosmology

19424 **(UCRL—52000-81-4) Energy and technology review.** (Lawrence Livermore National Lab., CA (USA)). Apr 1981. Contract W-7405-ENG-48. 34p. NTIS, PC A03/MF A01.

Activities at Lawrence Livermore Laboratory are reported for the areas of: shock wave studies, modeling the giant planets; modeling of solid state materials for solar cells; and flame quenching in internal combustion engines. (GHT)

19425 (UCRL—52000-81-4, pp 1-10) **Shock-wave studies: modeling the giant planets.** Apr 1981. NTIS, PC A03/MF A01.

In Energy and technology review.

The giant planets - Jupiter, Saturn, Uranus, and Neptune - are known to differ markedly from the well-studied inner, or terrestrial, planets. Observations of their average density, gravitational moments, and atmospheric composition have enabled researchers to draw some conclusions as to their structure, but efforts have been hampered by a lack of accurate data on the chemical, physical, and thermodynamic properties of constituent materials at the extremely high temperatures and pressures characteristic of planetary interiors. Shock-wave experiments conducted recently at LLNL have enabled us to develop more accurate equations of state for many of these materials, and these equations of state have made models of the giant planets more accurate.

19426 (UH—511-365-79) Computer simulation of the DUMAND optical array. Stenger, V.J. (Hawaii Univ., Honolulu (USA). Dept. of Physics and Astronomy). 7 Nov 1979. Contract AC03-76ER00511. 16p. (CONF-790899—2). NTIS, PC A02/MF A01.

From 14. Pacific science congress; Khabarovsk, USSR (Aug 1979).

A Monte Carlo simulation of the DUMAND optical array shows that muons with energies greater than 0.5 TeV are detectable with better than 90% efficiency and have an angular resolution better than 15 mr and energy resolution of at least 50%. Hadronic cascades with at least 2 TeV are detectable with greater than 90% efficiency and have an energy resolution which improves with increasing energy and is better than 50% above 15 TeV. Simulation and reconstruction of the neutrino events expected in one year's operation show that an 80 GeV W-boson would be detectable with 10σ precision in that time.

6403 Atomic, Molecular, And Chemical Physics

REFER ALSO TO CITATION(S) 18983, 19046, 19047, 19048

19427 (ANL—80-94, pp 163-200) **Experimental atomic and molecular physics research.** 1980. NTIS, PC A12/MF A01.

In Physics Division annual review, 1 April 1979-31 March 1980.

The Atomic Physics research in the Physics Division consists of five ongoing experimental programs: dissociation and other interactions of energetic molecular ions in solid and gaseous targets; beam-foil research and collision dynamics of heavy ions; photoionization-photoelectron research; spectroscopy of free atoms and molecules, high precision laser-rf double-resonance spectroscopy with atomic and molecular beams; and Moessbauer effect research.

19428 (ANL—80-94, pp 201-220) **Applied physics.** 1980. NTIS, PC A12/MF A01.

In Physics Division annual review, 1 April 1979-31 March 1980.

The Physics Division research program that is dedicated primarily to applied research goals involves the interaction of energetic particles with solids. This applied research is carried out in conjunction with the basic research studies from which it evolved.

19429 (BNL—28758) Peak-power dependence of rovibronic populations below the quasicontinuum during IR multiphoton absorption. Brenner, D.M. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 9p. (CONF-810609—1). NTIS, PC A02/MF A01.

From 8. international symposium on molecular beams; Cannes, France (1 Jun 1981).

Experimental studies on IR multiphoton absorption and dissociation have generally provided insight only into the relationship of IR laser characteristics such as power, wavelength, and mode structure to the observables dissociation yields, average number of photons absorbed, and product energy distribution. As a result, theoretical modeling of absorption at levels below the quasicontinuum has been based on facts somewhat removed from the actual phenomenon of interest. The experiments presented here provide information on the unperturbed rotational/vibrational populations of levels subsequent to IR excitation at levels below 4000 cm^{-1} of energy. The experiment makes use of molecular beam techniques in conjunction with IR-visible double resonance. A CO_2 laser of known pulse duration prepares vibrationally excited thiophosgene, $Cl_2C = S$. The absorbing transition is 2 ν_4. A tunable nitrogen-pumped dye laser scans the visible excitation spectrum to probe the perturbed rotational-vibrational populations of the pumped mode. Because the electronic transition is electric dipole forbidden, combination hot bands having the appropriate quantum numbers of the ground state are used in the analysis.

19430 (CONF-810441—1) Discovering the nature of things by counting the atoms. Hurst, G.S. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 38p. NTIS, PC A03/MF A01.

From Symposium in honor of Lewis Cochran; Lexington, KY, USA (10 Apr 1981).

The development of the theory of atoms is traced from Democritus to modern times. (GHT)

19431 (DOE/ER/10512—T2) Experiments on continuum electron capture in atomic hydrogen and collisional interaction of trapped ions. Progress report. Sellin, I.A.; Elston, S.B. (Tennessee Univ., Knoxville (USA). Dept. of Physics). 1981. Contract AS05-79ER10512. 14p. NTIS, PC A02/MF A01.

This section describes the background and scope of as well as progress made on experiments designed to test the present theory of charge exchange to continuum for the case of bare nuclei on atomic hydrogen. The charge transfer process is well known to be an essential ingredient of any attempt to understand the ionization of gaseous media traversed by highly-charged energetic ions. Surprisingly, a sometimes dominant contribution to such ionization remained undiscovered until the past decade. This process, known as charge transfer to the continuum, involves the ionization of electrons from the target species into unbound states closely matched in exit direction and speed to the charged particles which generate them. Subsequent measurements of the resultant forward electron production, performed by University of Tennessee searchers at Oak Ridge and Brookhaven National Laboratories, were unique in employing more highly charged projectiles than previously.

19432 (DOE/ER/10748—1) Many-body processes in atomic and molecular physics. Progress report. Chu, S.I. (Kansas Univ., Lawrence (USA). Dept. of Chemistry). 1981. Contract AC02-80ER10748. 13p. NTIS, PC A02/MF A01.

A proposal is presented for theoretical efforts towards the following projects: (1) carry out rotational predissociation lifetime calculations of several van der Waals molecules for which accurate potential energy surfaces were obtained recently by van der Waals molecular spectroscopic methods; (2) development and extension of the complex coordinate - coupled channel formalism to vibrational predissociation studies; (3) Floquet theory study of the quantum dynamics of multiphoton excitation of vibrational-rotational states of small molecules by laser light; (4) development and extension of the method of complex quasi-vibrational energy formalism to the study of intense field multiphoton dissociation of diatomic molecules and to photodissociation process in the presence of shape resonances; (5) investigation of the external field effects in multiphoton excitation and dissociation of small molecules. Depending on time and resources, several other projects may also be pursued. A detailed discussion covering these proposed projects is presented.

19433 (LA-UR—81-972) Laser-induced breakdown spectroscopy: a technique for atomic detection and molecular identification. Loree, T.R.; Radziemski, L.J. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 18p. (CONF-810429—6). NTIS, PC A02/MF A01.

From Conference on optics; Santa Fe, NM, USA (6 Apr 1981).

The emission spectra from laser-induced breakdown plasmas as a technique for atomic identification is used with time resolution to determine trace constituents in gases. (GHT)

19434 (LBL—12367) New aspects of buffer-gas effects in resonant spectrophones. Johnson, R.H.; Thomas, L.J. III.; Gerlach, R.; Amer, N.M. (Lawrence Berkeley Lab., CA (USA)). Jun 1981. Contract W-7405-ENG-48. 7p. (CONF-810630—1). NTIS, PC A02/MF A01.

From 2. international photoacoustic spectroscopy conference; Berkeley, CA, USA (22 Jun 1981).

Pressure dependent spectrophone Q's and frequency shifts were measured for 11 buffer gases and explained in terms of classical boundary layer effects and molecular relaxation.

19435 (ORNL/Sub—7802/1) Absolute experimental cross sections for the electron impact single, double, triple, and quadruple ionization of Cs^+ ions. Final technical report. Feeney, R.K.; Hertling, D.R. (Georgia Inst. of Tech., Atlanta (USA). School of Electrical Engineering). 28 Feb 1981. Contract W-7405-ENG-26. 42p. NTIS, PC A03/MF A01.

The absolute cross sections for the single, double, triple and quadruple ionization of Cs^+ ions by electron impact have been measured from below their respective thresholds to approximately 5000 eV. This determination has been accomplshed using a crossed beam facility in which monoenergetic beams of ions and electrons are caused to intersect at right angles in a well-defined collision volume. Multiply charged, product ions born as a result of the electron impact are deflected into their respective detectors by cascaded electrostatic analyzers. The multiply charged beam current component is measured by means of a vibrating reed electrometer operating in the rate-of-charge mode.

19436 (SAND—81-0110) Application of pulsed-uv laser Raman spectroscopy to chemical vapor deposition. Hargis, P.J. Jr. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 5p. (CONF-810613—4). NTIS, PC A02/MF A01.

From Conference on lasers and electro-optics; Washington, DC, USA (10 Jun 1981).

Raman detection limits obtained with a KrF laser excitation source were comparable to those obtained by laser-induced fluorescence and photofragment emission spectroscopy under chemical vapor deposition conditions.

19437 (SAND—81-0178C) Multiphoton ionization of $^{14}N^{16}O$ and $^{15}N^{16}O$ in a mass spectrometer. Johnson, A.W.; Smith, A.V. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 7p. (CONF-810613—5). NTIS, PC A02/MF A01.

From Conference on lasers and electro-optics; Washington, DC, USA (10 Jun 1981).

Multiphoton ionization with lasers is used as the ionization source in a mass spectrometer. A sensitive and selective technique is demonstrated for the detection of molecular isomers.

19438 Photomagnetic positron annihilation effects. Brandt, W. (New York Univ., NY). *Advances in Chemistry Series ;* No. 175, 89-107(1979). (CONF-770510—P4).

From 2. joint CIC/ACS conference; Montreal, Canada (31 May 1977).

The annihilation characteristics of positrons in phosphorescent substances can be altered by illumination with uv light. This phenomenon and its quantitative aspects agree with the idea that some positrons capture an electron to form ortho- or para-positronium, and that the interaction with the excited triplet states of the illuminated phosphor molecules quenches positronium through spin conversion. Photomagnetic positronium spin conversion cross sections are very large, approximately $10^4\pi\ \alpha^2_0$. They correspond to interaction ranges of about 30 A and are symptomatic of the wave mechanical behavior of positronium in matter. Analysis suggests that the photomagnetic effect proceeds by a process labeled spin flip in which ortho- and para-positronium interconvert under the simultaneous quenching of the excited triplet state to the singlet molecular ground state. 5 figures, 5 tables.

6451 Particle Interactions And Properties - Experimental

REFER ALSO TO CITATION(S) 19126

19439 (BNL—29357) Movable detector to search for neutrino oscillations in the BNL neutrino beam. Bozoki, G.; Fainberg, A.; Weygand, D.; Fagg, L.; Uberall, H.; Goldberg, M.; Meadows, B.; Saenz, A.W.; Seeman, N. (Brookhaven National Lab., Upton, NY (USA)). 1980. Contract AC02-76CH00016. 14p. (CONF-8010127—7). NTIS, PC A02/MF A01.

From Neutrino mass mini-conference; Cable, WI, USA (1 Oct 1980).

A simple, straightforward, and economic experiment utilizing a set of water Cherenkov counters is proposed to search for neutrino oscillations in the AGS neutrino beam. The detector will be movable and will be able to provide reasonable counting rates up to 2 km downstream of the pion decay tunnel. Whereas previous accelerator experiments have sought to increase the ratio l/p (with l the neutrino path length and p its momentum) by decreasing p, increasing l is suggested instead. Further, by making measurements at several different values of l with the same apparatus, many sources of systematic error are eliminated. The experiment will measure beam-associated muon- and electron-type events at each position. A change in the ratio of muon- to electron-type events as a function of position would be evidence for ν/sub μ/ + ν/sub e/ oscillations. Sensitivity in terms of $(\Delta m)^2$ (the square of the mass difference in the mass eigenstates) can be as low as 0.1 eV^2, for full mixing, which is below the most probable value found by Reines et al for Δm^2 in their electron neutrino reactor experiment. This experiment would be parasitic, running behind the usual neutrino beam experiments, assuming the nominal beam energy (peaked at 1 GeV), and would thus make a minimal demand on AGS support. It is suggested that the first two measurements be made inside the Isabelle tunnel at the points of intersection with the AGS neutrino beam. No further excavations would be required, and the data could be taken before ISA equipment is installed.

19440 (DOE/ER/10516—8) Nucleon-nucleon theory and phenomenology. Signell, P. (Michigan State Univ., East Lansing (USA)). Mar 1981. Contract AC02-79ER10516. 18p. NTIS, PC A02/MF A01.

This project involves five inter-related subprojects: (1) derivation of the intermediate range nucleon-nucleon interaction using a new method that utilizes much shorter and simpler analytic continuation through the unphysical region that lies between the πN and $\pi\pi$ physical regions of the N anti N $\rightarrow \pi\pi$ amplitude (with significantly improved accuracy for the nucleon-nucleon interaction); (2) construction of a short range phenomenological potential that, with the theoretical part mentioned above, gives a precise fit to the nucleon-nucleon data and is parameterized for easy use in nucleon calculations; (3) phase shift analyses of the world data below 400 MeV, especially the large amount of very precise data below 20 MeV and the new data near 55 MeV that have never been analyzed properly; (4) the introduction of a K-matrix formulation of the Optimal Polynomial Expansion in order to accelerate convergence of the partial wave series at LAMPF energies; and (5) setting up of a cooperatively evaluated permanent nucleon-nucleon data bank in the 0-1200 MeV range that can be used by all nucleon-nucleon reseachers.

19441 (DOE/ET/10516—9) Nucleon-nucleon theory and phenomenology. Progress report and renewal proposal, June 1, 1981-May 31, 1982. Signell, P. (Michigan State Univ., East Lansing (USA)). 1981. Contract AC02-79ER10516. 17p. NTIS, PC A02/MF A01.

This project has involved five inter-related subprojects: (1) derivation of the intermediate range nucleon-nucleon interaction using a new method that utilizes much shorter and simpler analytic continuation through the unphysical region that lies between the πN and $\pi\pi$ physical regions of the N anti N $\rightarrow \pi\pi$ amplitude (with signifantly improved accuracy for the nucleon-nucleon interaction); (2) construction of a short range phenomenological potential that, with the theoretical part mentioned above, gives a precise fit to the nucleon-nucleon data and is parameterized for easy use in nucleon calculations; (3) phase shift analyses of the world data below 400 MeV, especially the large amount of very precise data below 20 meV and the new data near 55 MeV that have never been analyzed properly; (4) the introduction of a K-matrix formulation of the Optimal Polynomial Expansion in order to accelerate convergence of the partial wave series at LAMPF energies; and (5) setting up of a cooperatively evaluated permanent nucleon-nucleon data bank in the 1-1200 MeV range that can be used by all nucleon-nucleon researchers.

19442 (FERMILAB-CONF—81/28-THY) Zeta-spectroscopy beyond 40 GeV. Buchmueller, W. (Fermi National Accelerator Lab., Batavia, IL (USA)). 1981. Contract AC02-76CH03000. 32p. (CONF-810246—1). NTIS, PC A03/MF A01.

From Z/sup o/ physics workshop; Ithaca, NY, USA (6 Feb 1981).

The zeta-family of bound states, formed by the anticipated t-quark and its antiquark, is discussed. The quantitative connection between the zeta-spectroscopy and the short distance behavior of the quark-antiquark potential is examined. It is pointed out that the next quarkonium system will lead to an accurate determination of the QCD scale parameter Λ. Weak zeta-decays are briefly considered.

19443 **(LBL—91(Rev.)(4-80)) Compilation of current high-energy-physics experiments.** Wohl, C.G.; Kelly, R.L.; Armstrong, F.E. (Lawrence Berkeley Lab., CA (USA)). Apr 1980. Contract W-7405-ENG-48. 29p. NTIS PC E02/ MF $3.50.

Includes 1 sheet of 48x reduction microfiche.

This is the third edition of a compilation of current high energy physics experiments. It is a collaborative effort of the Berkeley Particle Data Group, the SLAC library, and ten participating laboratories: Argonne (ANL), Brookhaven (BNL), CERN, DESY, Fermilab (FNAL), the Institute for Nuclear Study, Tokyo (INS), KEK, Rutherford (RHEL), Serpukhov (SERP), and SLAC. The compilation includes summaries of all high energy physics experiments at the above laboratories that (1) were approved (and not subsequently withdrawn) before about January 1980, and (2) had not completed taking of data by 1 January 1976.

19444 **(SLAC—236) Study of the reactions psi′ → γγypsi.** Oreglia, M.J. (Stanford Linear Accelerator Center, CA (USA)). Dec 1980. Contract AC03-76SF00515. 234p. NTIS, PC A11/MF A01.

A large solid angle array (the Crystal Ball detector) of NaI(Tl) crystals, together with spark and multiwire proportional chambers for charged particle tracking, is used to study the decays of the psi′ meson. Cascade reactions of the form psi′ → γchi, chi → γpsi, psi → (e^+e^- or $\mu^+\mu^-$) are used in this experiment to observe the intermediate chi states and to measure their spin by analyzing the angular correlations among the final-state particles. In addition, the multipole coefficients describing the individual radiative transitions are measured using the angular correlations. Values of J = 2 and J = 1 are obtained for the chi states with masses of 3.55 and 3.51 GeV, respectively. Radiative transitions to and from the chi states are found to be dominantly E1 in nature. The well-established J = 0 chi(3.41) state is observed in a cascade reaction, with a branching ratio BR(psi′ → γchi → γγpsi) = (0.06 +- 0.02 +- 0.01)%; the first error describes uncertainties arising from statistics and acceptance corrections, while the second error is systematic. Branching ratios of (1.26 +- 0.08 +- 0.20)% for chi(3.55) and (2.38 +- 0.12 +- 0.38)% for chi(3.51) are consistent with those obtained in previous experiments. Natural line-widths of (4 +- 1) MeV for chi(3.55) and a full width consistent with the resolution of the apparatus for chi(3.51) are obtained.

19445 **(SLAC-PUB—2699) Review of new experimental upper limits on forbidden decay modes of the tau lepton.** Hayes, K.G.; Perl, M.L. (Stanford Linear Accelerator Center, CA (USA)). Feb 1981. Contract AC03-76SF00515. 13p. (CONF-801244—7). NTIS, PC A02/MF A01.

From Workshop on weak interactions as probes of unification; Blacksburg, VA, USA (3 Dec 1980).

This paper presents a review of experimental upper limits on the branching fractions for various forbidden decay modes of the tau lepton. These are modes which cannot occur in the conventional model in which the tau and its associated neutrino have a unique, conserved lepton number. The limits are based on data acquired by the Mark II Detector Collaboration at SPEAR.

19446 **High energy physics-1980.** Durand, L.; Pondrom, L.G. (eds.). Schenectady, NY; American Institute of Physics (1981). 834p. (CONF-800724—(Vol.1)).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

Topics covered in Part 1 include: hadronic interactions, theory and experiment; new particle production; low energy weak interactions and weak decays; quantum flavordynamics and unified theories; e^+e^- physics and electromagnetic properties, experiment and theory; and lepton-nucleon interactions. Abstracts of individual items from the conference were prepared separately for the data base. (GHT)

19447 **High energy physics-1980.** Durand, L.; Pondrom, L.G. (eds.). Schenectady, NY; American Institute of Physics (1981). 836p. (CONF-800724—(Vol.2)).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

Topics covered in Part 2 include: cosmic rays; new accelerators and new experimental techniques; gauge theories and mathematical physics; and plenary sessions in accelerators and experimental techniques, weak interactions, hadron dynamics, e^+e^- physics and new particle production, and new theoretical developments. Abstracts of individual items from the conference were prepared separately for the data base. (GHT)

19448 (INIS-mf—5797, pp G93-G138) **Review of recent physics at the SLAC SPEAR storage ring and a progres report on experiment preparation for the PEP interaction regions.** Ballam, J. (Stanford Linear Accelerator Center, CA (USA)). [nd]. NTIS (US Sales Only).

From 9. international symposium on high energy multiparticle dynamics; Tabor, Czechoslovakia (2 Jul 1978).

A review is presented of recent data obtained at SPEAR from the leptonic nature, spin decay modes and weak coupling of the tau meson, to the latest analysis of the $\mu^+\mu^-$ asymmetry and to the most recent determination of the ratio R = e^+e^- → hadrons/ e^+e^- → $\mu^+\mu^-$. The current state is described of the PEP storage rings construction and characteristics are given of certain detectors, such as the magnetic calorimeter, the time projection chamber and the high resolution spectrometer.

19449 (INIS-mf—5797, pp F81-F95) **Antineutrino-proton interactions at FNAL.** Barnes, V.E. (Purdue Univ., Lafayette, IN (USA). Dept. of Physics). [nd]. NTIS (US Sales Only).

From 9. international symposium on high energy multiparticle dynamics; Tabor, Czechoslovakia (2 Jul 1978).

Anti νp and νp interactions from the Fermilab 15-foot bubble chamber are studied in terms of deep inelastic scaling variables and a hadronic scaling variable. Many features of the data agree well with a simple quark parton model which includes quark → hadron fragmentation functions. The data permit measurement of the antiquark sea and the down quark to up quark ratio in the proton. Scaling violation is observed as an energy dependence of the mean value of XY similar to that seen in ep and μp scattering. Evidence is obtained for universality of the fragmentation functions in lepton-lepton and lepton-hadron collisions, and the data suggest the first observation of charm production by antineutrinos, acting on the antiquark sea in the proton.

6452 Particle Interactions And Properties - Theoretical

19450 **(DOE/ER/01545—298) Neutrino mixing in SO(10)*.** Milton, K.; Tanaka, K. (Ohio State Univ., Columbus (USA). Dept. of Physics). 1981. Contract AC02-76ER01545. 13p. (CONF-810134—1). NTIS, PC A02/MF A01.

From Orbis scientiae conference; Fort Lauderdale, FL, USA (19 Jan 1981).

The question of neutrino mixing is considered within the grand unified field theory. (GHT)

19451 **(FERMILAB-Conf—80/99-THY) Why most flavor dependence predictions for nonleptonic charm decays are wrong. Flavor symmetry and final state interactions in nonleptonic decays of charmed hadrons.** Lipkin, H.J. (Fermi National Accelerator Lab., Batavia, IL (USA); Argonne National Lab., IL (USA)). Sep 1980. Contract AC02-76CH03000. 21p. (CONF-800787—4). NTIS, PC A02/MF A01.

From International school of physics enrico fermi; Varenna, Lake Como, Italy (Jul 1980).

Nonleptonic weak decays of strange hadrons are complicated by the interplay of weak and strong interactions. Models based either on symmetry properties or on the selection of certain types

of diagrams are both open to criticism. The symmetries used are all broken in strong interactions, and the selection of some diagrams and neglect of others is never seriously justified. Furthermore, the number of related decays of strange hadrons is small, so that experimental data are insufficient for significant tests of phenomenological models with a few free parameters. The discovery of charmed particles with many open channels for nonleptonic decays has provided a new impetus for a theoretical understanding of these processes.

19452 (LA—8760-MS) Possibility of studying ν/sub e/ and anti ν/sub e/ interactions at a Kaon Factory. Hoffman, C.M. (Los Alamos Scientific Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 8p. NTIS, PC A02/MF A01.

The possibility of observing ν/sub e/- and anti ν/sub e/-induced reactions at a high-flux Kaon Factory is discussed. A recently suggested neutrino beam derived from K/sub L/^{0} decays is the enriched source of ν/sub e/ and anti ν/sub e/. Some specific measurements which are feasible are described.

6453 Particle Invariance Principles And Symmetries

19453 (BNL—29092) Neutrino mass and unification. Senjanovic, G. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 18p. (CONF-810135—1). NTIS, PC A02/MF A01.

From Neutrino oscillation workshop; Upton, NY, USA (30 Jan 1981).

In this talk a discussion of neutrino masses in grand unified theories is presented. Special care is paid to the question of intermediate mass scales and it is shown how they play a crucial role in the predictions for neutrino masses. SU(5) and SO(10) models are covered, with SO(10) offering a possibility of low energy parity restoration and appreciable neutrino masses and lepton number violation.

19454 (FERMILAB-CONF—80/98-THY) Who needs baryon spectroscopy. Lipkin, H.J. (Argonne National Lab., IL (USA); Fermi National Accelerator Lab., Batavia, IL (USA)). Sep 1980. Contract AC02-76CH03000. 16p. (CONF-800763—6; ANL-HEP-CP—80-67). NTIS, PC A02/MF A01.

From Baryon 80 conference; Toronto, Canada (14 Jul 1980).

What a baryon is, what a quark is and what its mass is, who needs the gas, baryon models can help us learn new physics, baryon physics left after the Isgur-Karl Model, mesons and baryons made of the same quarks, can multiquark spectroscopy survive the baryonium catastrophe, and what we can learn from precise measurements of baryon magnetic moments are discussed.

6454 Field Theory

REFER ALSO TO CITATION(S) 19453

19455 (FERMILAB-Conf—80/101-THY) Exotic multiquark states with charm. Lipkin, H.J. (Fermi National Accelerator Lab., Batavia, IL (USA); Argonne National Lab., IL (USA)). Oct 1980. Contract AC02-76CH03000. 19p. (ANL-HEP-CP—80-71; CONF-800787—2). NTIS, PC A02/MF A01.

From International school of physics enrico fermi; Varenna, Lake Como, Italy (Jul 1980).

The existence of multiquark states is discussed, and a model is sought to estimate the binding of multiquark hadrons and threshold exotics. For this, a naive quark model is used, which suggests that spatial configurations exist in which potential energies can barely win over the kinetic energies to produce a bound state.

65 PHYSICS RESEARCH

6510 Nuclear Physics

REFER ALSO TO CITATION(S) 19126, 19467, 19470

19456 (BNL—51115(Vol.1), pp 1-58) Heavy ion reactions at intermediate energy: observations, extrapolations, speculations. Gelbke, C.K. (Michigan State Univ., East Lansing). Nov 1979. NTIS, PC A21/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

Some experimental results on intermediate energy heavy ion reactions that have become available in the last few years are discussed, and areas of interest for future research are pointed out. 21 references, 29 figures. (GHT)

19457 (DOE/ER/10638—T1) Nuclear structure studies using the High Resolution Spectrometer at the Los Alamos Clinton P. Anderson Meson Physics Facility. Progress report. (Texas Univ., Austin (USA)). Jan 1981. Contract AS05-80ER10638. 92p. NTIS, PC A05/MF A01.

The research described in this document is concerned with obtaining detailed microscopic nuclear structure information (both ground state and excited state) through analysis of experimental data which have been, and which will be, obtained using the High Resolution Spectrometer (HRS) at the Los Alamos Clinton P. Anderson Meson Physics Facility (LAMPF). Three types of experiments and related theoretical work constitute the research programs: (1) those which provide nucleon-nucleon data to determine the key amplitudes required for microscopic analysis of intermediate energy p-nucleus elastic and inelastic scattering data, (2) those which provide data that validate fundamental ideas implicit in the formulation of the microscopic theories, and (3) those which provide data to be analyzed to provide detailed nuclear structure information.

19458 Polarization phenomena in nuclear physics, 1980. Part 1. Ohlsen, G.G.; Brown, R.E.; Jarmie, N.; McNaughton, W.W.; Hale, G.M. (eds.). Contract W-7405-ENG-36. New York, NY; American Institute of Physics (1981). 814p. (CONF-800824—(Vol.1)). Copyright Clearance Center, Inc., Schenectady, NY.

From 5. international symposium on polarization phenomena in nuclear physics; Santa Fe, NM, USA (11 Aug 1980).

Abstracts of individual items from the conference were prepared separately for the data base. Part one includes: nucleon-nucleon and high energy polarization phenomena, and polarization in nuclear structure physics. (GHT)

19459 Polarization phenomena in nuclear physics, 1980. Part 2. Ohlsen, G.G.; Brown, R.E.; Jarmie, N.; McNaughton, W.W.; Hale, G.M. (eds.). Contract W-7405-ENG-36. New York, NY; American Institute of Physics (1981). 810p. (CONF-800824—(Vol.2)). Copyright Clearance Center, Inc., Schenectady, NY.

From 5. international symposium on polarization phenomena in nuclear physics; Santa Fe, NM, USA (11 Aug 1980).

Abstracts of individual items from the conference were prepared separately for the data base. Topics covered in Part 2 include: polarized beam and target technology, techniques and formalism; polarization studies with heavy ions, new developments in related fields, exotica, and applications; polarization effects in light nuclei; and basic symmetries. (GHT)

6511 Experimental Techniques

19460 (MLM—2807) GRPNL2: an automated program for fitting gamma and x-ray peak multiplets. Fleissner, J.G.; Gunnink, R. (Mound Facility, Miamisburg, OH (USA)). 30 Mar 1981. Contract AC04-76DP00053. 130p. NTIS, PC A07/MF A01.

GRPNL2 is a peak fitting program for calculating gamma-ray and x-ray peak areas of complex multiplets in spectra taken with germanium detectors. It is an automated, that is non-interactive, version of the computer code GRPANL. The program is designed for ease of repetitive analyses. Input data, required for the

spectral stripping, are stored on disk files. An iterative least-squares technique is used for the multiplet fitting process. GRPNL2 is intended for the user who requires accurate spectral analysis with a minimum of operator intervention. The code described here allows for 16 free parameters in a multiplet region that can contain up to 150 data channels. The code operates on the PDP-11 series minicomputer having 32K words of memory and disk storage capability.

19461 **(ORNL—5732) TPASS: a gamma-ray spectrum analysis and isotope identification computer code.** Dickens, J.K. (Oak Ridge National Lab., TN (USA)). Mar 1981. Contract W-7405-ENG-26. 93p. NTIS, PC A05/MF A01.

The gamma-ray spectral data-reduction and analysis computer code TPASS is described. This computer code is used to analyze complex Ge(Li) gamma-ray spectra to obtain peak areas corrected for detector efficiencies, from which are determined gamma-ray yields. These yields are compared with an isotope gamma-ray data file to determine the contributions to the observed spectrum from decay of specific radionuclides. A complete FORTRAN listing of the code and a complex test case are given.

6512 Nuclear Properties And Reactions, A=1-5

19462 **(LA—8733-MS) COVFILS: 30-group covariance library based on ENDF/B-V.** Muir, D.W.; LaBauve, R.J. (Los Alamos National Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 195p. (ENDF—306). NTIS, PC A09/MF A01.

A library of 30-group cross sections and covariances called COVFILS has been prepared from ENDF/B-V data using the NJOY code system. COVFILS includes data on the total cross section, scattering cross sections, and the most important absorption cross sections for ^{1}H, ^{10}B, C, ^{16}O, Cr, Fe, Ni, Cu, and Pb. This report contains detailed descriptions of various features of the library, a listing of a FORTRAN retrieval program, and 143 plots of the multigroup cross-section uncertainties and their correlations.

6513 Nuclear Properties And Reactions, A=6-19

REFER ALSO TO CITATION(S) 19462, 19480

19463 (BNL—51115(Vol.2), pp 759-767) **Angular momentum dissipation and spin orientation of light and heavy fragments in deep-inelastic reactions induced by ^{16}O on Ti and Ni.** Hering, W.; Duennweber, W.; Lauterbach, C.; Puchta, H.; Trautmann, W. (Muenchen Univ., Germany). Nov 1979. NTIS, PC A22/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

The question of the dynamical behaviour of a system of two interacting heavy ions is very complex and calls for various approaches. One aspect concerns the mechanism of angular momentum transfer into excitation spins of the reaction partners which has been investigated by various methods. In this paper, the results of a study of the intensities and angular correlations of yrast transitions in the heavy fragments as well as the deexcitation gammas of excited ejectiles measured in coincidence with the light fragments from the 96 MeV $^{16}O + {}^{48}Ti$ reaction are reported. These results are combined with earlier measurements of the circular polarization of gamma radiation from the reaction $^{16}O + {}^{58}Ni$ to try to find some systematic features of the reaction dynamics in mass asymmetric systems at modest bombarding energies.

19464 **Experimentally determined thick target yields for the ^{14}N (p,α)^{11}C reaction.** Bida, G.T.; Ruth, T.J.; Wolf, A.P. (Brookhaven National Lab., Upton, NY (USA). Dept. of Chemistry). *Radiochimica Acta ;* **27**: No. 4, 181-185(1980).

Thick target yields and absolute cross sections for the $^{14}N(p,\alpha)^{11}C$ reaction were measured at the Brookhaven tandem Van de Graaff and 60-inch cyclotron facilities for proton energies in the range from near threshold to 18 MeV. Solid targets of Kapton were irradiated and the ^{11}C-activity produced was assayed in a calibrated well-type scintillation counter. The absolute cross sections compare reasonably well with previously published results; however, significant discrepancies are noted. The experimentally determined thick target yields are compared to yields calculated from a previously published excitation function. The calculated yields are consistently about 25% higher than the experimental results. These measurements indicate that a gas target system used for ^{11}C production is only about 50% effective. The reason for the low yield in the gas target and implications in terms of target design are discussed.

6514 Nuclear Properties And Reactions, A=20-38

REFER ALSO TO CITATION(S) 19472

19465 (ANL—80-94, pp 25-56) **Heavy-ion research at the tandem and superconducting linac accelerators.** 1980. NTIS, PC A12/MF A01.

In Physics Division annual review, 1 April 1979-31 March 1980.

The heavy-ion research program at the Argonne Physics Division is principally aimed at the study of nuclear structure and its manifestation in heavy-ion induced nuclear reactions. In order to extract information on nuclear structure, measurements with high precision often need to be performed. Such measurements are now carried out at the tandem-linac accelerator over a wide energy range. The investigation of high-spin states near the yrast line has provided much new information on the behavior of nuclei at high angular momentum. Argonne work has concentrated on nuclei where high-spin isomers, the so-called yrast traps, are prevalent. The resonance effects observed previously in the $^{24}Mg(^{16}O,{}^{12}C)^{28}S$ i reactions have been further explored through both additional measurements and a new quantitative method of analysis. The measurements were extended in energy and angular range and to various exit channels as well as similar systems. Several measurements were performed to investigate the reaction mechanisms in heavy-ion induced reactions and to map out the distribution of reaction strength as a function of energy and target-projectile masses energy regions previously not accessible. The behavior of the quasi- and deep-inelastic reaction cross sections was studied as a function of energy for medium-heavy systems, the production of inclusive alpha-particle yields for ^{16}O beams at energies E/A $\geqq$ 5 MeV/nucleon, and excitation functions, mass and kinetic energy distributions for heavy-ion induced fusion-fission reactions.

19466 (BNL—51115(Vol.2), pp 769-778) **Study of the $^{20}Ne + {}^{197}Au$ reaction at incident energies between 150 and 400 MeV.** Homeyer, C.; Egelhaaf, C.; Fuchs, H.; Gamp, A.; Bohlen, H.G.; Kluge, H. (Institut fuer Kernphysik, Berlin, Germany). Nov 1979. NTIS, PC A22/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

The $^{20}Ne + {}^{197}Au$ reaction has been studied at incident energies of 7.5, 11.0, 11.0, 14.5 and 20 MeV/N. Total isotopic yields, energy and angular distributions have been measured. From systematics in the energy spectra and the comparison of light-particle to heavy fragment yields evidence for a rapid onset of nonequilibrium processes above 10 MeV/N is obtained. It is found that for the explanation of final fragment yields and energy distributions more than one-step processes have to be taken into account.

6515 Nuclear Properties And Reactions, A=39-58

REFER ALSO TO CITATION(S) 19462, 19463, 19473, 19482

19467 **(BNL—51115(Vol.1)) Proceedings of the symposium on heavy ion physics from 10 to 200 MeV/amu.** Barrette, J.; Bond, P.D. (eds.). (Brookhaven National Lab., Upton, NY (USA)). Nov 1979. Contract AC02-76CH00016. 487p. (CONF-790743—(Vol.1)). NTIS, PC A21/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

The symposium covers heavy ion physics in the energy range 10 to 200 MeV/amu. Abstracts of individual items from the symposium were prepared separately for the data base. (GHT)

19468 (BNL—51115(Vol.1), pp 59-91) **Light charged particles emitted in coincidence with deeply inelastic collisions in the 280 MeV $^{40}Ar + {}^{58}Ni$ reaction.** Guerreau, D. (Institut de Physique Nuclear, Orsay, France); Galin, J.; Babinet, R. Nov 1979. NTIS, PC A21/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

A detailed study was made of the light charged particles (mainly protons and alpha particles) in coincidence with the main fragments from deep inelastic collisions in the reaction 280 MeV $^{40}Ar + {}^{58}Ni$. A survey of relevant data is followed by a discussion of the origin of the light charged particles as it can be deduced from the p, α-fragment coincidence experiment. The results of out-of-plane distributions of the α-particles are presented and they are discussed in terms of the extreme sticking limit. (GHT)

19469 (BNL—51115(Vol.1), pp 273-305) **Production of neutron-rich nuclei at 200 MeV/nucleon.** Symons, T.J.M. (Univ. of California, Berkeley). Nov 1979. NTIS, PC A21/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

Ways that heavy ion accelerators have been used to produce neutron rich isotopes are discussed. These include: fusion-evaporation reactions; transfer reactions; deep-inelastic scattering; and heavy ion fragmentation. Experiments using beams of ^{40}Ar and ^{48}Ca at 205 MeV/nucleon and 212 MeV/nucleon respectively, are described. (GHT)

19470 (BNL—51115(Vol.2)) **Proceedings of the symposium on heavy ion physics from 10 to 200 MeV/AMU.** Barrette, J.; Bond, P.D. (eds.). (Brookhaven National Lab., Upton, NY (USA)). Nov 1979. Contract AC02-76CH00016. 502p. (CONF-790743—(Vol.2)). NTIS, PC A22/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

The symposium covers heavy ion physics in the energy range 10 to 200 MeV/AMU. Abstracts of individual items from the symposium were prepared separately for the data base. (GHT)

19471 (BNL—51115(Vol.2), pp 545-560) **Subthreshold pion production with heavy ions.** Benenson, W. (Michigan State Univ. East Lansing). Nov 1979. NTIS, PC A22/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

An experiment which measured pion production from 125 to 400 MeV/nucleon heavy ion collisions is described. It is shown that Coulomb effects to the π^- to π^+ ratio are very large and give some interesting insights into the reaction mechanism.

6516 Nuclear Properties And Reactions, A=59-89

REFER ALSO TO CITATION(S) 19471, 19476, 19501

19472 (BNL—51115(Vol.2), pp 735-740) **Entrance channel dependence of fission-like processes from ^{102}Pd.** Coffin, J.P.; Guillaume, G.; Heusch, B.; Rami, F.; Wagner, P.; Wegner, H.E. (Strasbourg-1 Univ., France). Nov 1979. NTIS, PC A22/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

The completely relaxed reaction products resulting from the bombardment of ^{74}Ge with ^{28}Si (E/sub ^{28}Si/ = 137 MeV) and of ^{65}Cu with ^{37}Cl (E/sub ^{37}Cl/ = 144.8 MeV) have been measured by time of flight at the Strasbourg MP Tandem. Both reactions lead to ^{102}Pd as a compound or composite nucleus and the relevant parameters are given. The grazing angular momenta have been deduced from elastic scattering measurements analyzed with the Optical Model computer code GENOA.

6517 Nuclear Properties And Reactions, A=90-149

19473 (DOE/ER/10565—1) **Cyclotron-based nuclear science. Progress report, April 1, 1979-March 31, 1980.** (Texas A and M Univ., College Station (USA). Cyclotron Inst.). Jun 1980. Contract AS05-80ER10565. 120p. NTIS, PC A06/MF A01.

Research at the cyclotron institute is summarized. These major areas are covered: nuclear structure; nuclear reactions and scattering; polarization studies; interdisciplinary nuclear science; instrumentation and systems development; and publications. (GHT)

19474 **Even-even neutron-rich isotopes. Chapter 4.** Cheifetz, E.; Selic, H.A.; Wolf, A.; Chechik, R. (Weizmann Inst. of Science, Rehovoth (Israel)); Wilhelmy, J.B. (Los Alamos Scientific Lab., NM (USA)). pp 193-207 of Nuclear spectroscopy of fission products. von Egidy, T. (ed.). Bristol, England; The Institute of Physics (1980).

From Workshop on the nuclear spectroscopy of fission products; Grenoble, France (21 - 23 May 1979).

Nuclear spectroscopy of even-even fission products is discussed in view of available data and techniques with emphasis on the capabilities of studying the prompt de-excitation spectra. Sources of fission products and their expected yields are evaluated with respect to neutron richness. Experimental methods and specific experiments of detecting radiations from unseparated fission products for assignments of levels, lifetime measurements, and measurements based on the initial alignment of the fragments are described. Some preliminary results from an experiment with a source of ^{254}Cf are given. The above results are incorporated with results from detailed studies following beta decays to give a general picture of the region of transition nuclei leading to deformations in the rare earth and the onset of deformation in the Zr-Mo-Ru fission products.

19475 **Delayed neutron branches by γ-spectroscopy. Chapter 5.** Warner, R.A.; Alquist, L.J.; Kiefer, R.L.; Reeder, P.L. (Battelle Pacific Northwest Labs., Richland, WA (USA)); Ruddy, F.H. (Washington State Univ., Pullman (USA). Nuclear Radiation Center). pp 311-314 of Nuclear spectroscopy of fission products. von Egidy, T. (ed.). Bristol, England; The Institute of Physics (1980).

From Workshop on the nuclear spectroscopy of fission products; Grenoble, France (21 - 23 May 1979).

Delayed neutron emission probabilities have been determined for Rb and Cs fission fragments by γ-spectroscopy of the precursors and their daughters. Sources were deposited on a movable tape by the SOLAR on-line mass spectrometer and viewed by a Ge(Li) detector. The γ spectra were multiscaled. Results are compared with those from counting neutrons per ion or β.

6518 Nuclear Properties And Reactions, A=150-189

REFER ALSO TO CITATION(S) 19465

19476 (BNL—51115(Vol.1), pp 221-233) **Fast splitting of projectile-like fragments in the reaction ^{86}Kr ^{166}Er at 12.1 MeV/u.** Lynen, U. (Max-Planck-Institut fuer Kernphysik, Heidelberg, Germany). Nov 1979. NTIS, PC A21/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

In this report first results of the reaction ^{86}Kr ^{166}Er at an incident energy of 12.1 MeV/u will be reported. The reason for extending the investigation of deep-inelastic collisions (DIC) to higher energies is twofold: on the one hand, a comparison of the new results with extrapolations of the present understanding of DIC might help to disentangle the effects of nuclear structure and of the dynamics of the reaction, and, on the other hand, to find new phenomena. As an example, the high momentum resulting from the coherent motion of all projectile nucleons when impinging on the target nucleus should favor collective modes of excitation.

19477 **Recent results obtained very far from stability at ISOLDE: neutron deficient odd-A iridium nuclei and triaxiality.** Schueck, C. (Paris-11 Univ., 91 - Orsay (France). Centre de Spectrometrie Nucleaire et de Spectrometrie de Masse); Knipper, A. (Strasbourg-1 Univ., 67 (France). Centre de Recherches Nucleaires); Richard-Serre, C. (European Organization for Nuclear Research, Geneva (Switzerland)); Berg, V.; Zerrouki, A. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Genevey-Rivier, J. (Grenoble-1 Univ., 38 (France). Inst. des Sciences Nucleaires). pp 127-132 of Future directions in studies of nuclei far from stability. Hamilton, J.H.; Spejewski, E.H.; Bingham, C.R.; Zganjar, E.F. (eds.). Amsterdam, Netherlands; North-Holland (1980).

From International symposium on future directions in studies of nuclei far from stability; Nashville, TN, USA (10 Sep 1979).

The improved facilities of the ISOLDE isotope separator on-line with the 600 MeV synchrocyclotron at CERN opened the possibility to reach nuclei very far from stability (as far as 22 neutrons deficient in the Cs region and 27 neutrons deficient in the Hg region). Simultaneously the development of on-line spectrometry allowed the study of nuclei with very short half-lives and low counting rates. Results recently obtained in the odd-A iridium region are presented after a short summary of recent on-line device developments and results.

19478 **Study of shape coexistence in ^{149}Pm and ^{151}Pm. Chapter 5.** Walters, W.B.; Glascock, M.D.; Schneider, E.W. (Maryland Univ., College Park (USA)); Meyer, R.A. (California Univ., Livermore (USA). Lawrence Livermore Lab.); Smith, H.A.; Bunker, M.E. (Los Alamos Scientific Lab., NM (USA)). pp 303-310 of Nuclear spectroscopy of fission products. von Egidy, T. (ed.). Bristol, England; The Institute of Physics (1980).

From Workshop on the nuclear spectroscopy of fission products; Grenoble, France (21 - 23 May 1979).

Recent studies of the structures of odd-proton nuclides with N = 88 and 90 have indicated that the transition from non-deformed to deformed states may vary with proton number. The decay of 1.7h ^{149}Nd to levels of $_{61}{}^{149}Pm_{88}$ and the decay of 12.4 min ^{151}Nd to levels of $_{61}{}^{151}Pm_{90}$ have been studied in a search for evidence for coexistence of deformed and non-deformed structures in these nuclides.

6519 Nuclear Properties And Reactions, A=190-219

REFER ALSO TO CITATION(S) 19462, 19466, 19477, 19484, 19501

19479 (BNL—51115(Vol.2), pp 801-811) **Multi-phonon and giant resonance excitation in inclusive heavy ion inelastic scattering.** Lee, S.Y.; Braun-Munzinger, P. (State Univ. of New York, Stony Brook). Nov 1979. NTIS, PC A22/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

The potential usefulness of high energy heavy ion reactions in probing collective surface modes of nuclei was studied. The hope is that with heavy ions as projectiles one may strongly and selectively excite a variety of collective degrees of freedom. Especially the finding of collective modes with high multipolarity is important for the understanding of nuclear collective motion and may shed light on the role of such states as doorways to more complicated reaction processes such as deep inelastic scattering and fusion reactions. Furthermore, the position and widths of these giant resonances can be compared to predictions of RPA theories and, thereby, provide a test of the effective force of nucleons in nuclei. A powerful method, related to the Taylor series expansion of the nuclear Hamiltonian, is the Austern-Blair (A-B) model of the inelastic excitation. In the A-B model, the transition S-matrix element is related to the elastic S-matrix by simple algebraic operations. The A-B model as applied to single excitations has been tested to be very reliable in many occasions. The A-B model is used to describe single and multiple phonon excitation induced by α-particles and heavy ions impinging on ^{208}Pb.

19480 (BNL—51115(Vol.2), pp 813-820) **Direct-reaction contributions to projectile-fragment spectra at 5 to 20 MeV/Nucleon.** McVoy, K.W.; Nemes, C. (Univ. of Wisconsin, Madison). Nov 1979. NTIS, PC A22/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

Reactions in which a target is bombarded by a relatively light projectile nucleus like ^{16}O, and a still lighter nucleus, presumed to be a fragment of the projectile, is observed to emerge are considered. As specific examples, recent data by Gelbke et al. and by McGrath et al., in which ^{16}O bombards, ^{209}Pb or ^{58}Ni at energies of 3 to 15 MeV/nucleon above the Coulomb barrier, and spectra are measured, at a variety of angles, for outgoing fragments between ^{6}Li and ^{15}N are considered.

19481 (BNL—51115(Vol.2), pp 861-872) **Distinction between direct and statistical contributions to projectile-fragment spectra.** Nemes, M.C. (Univ. of Wisconsin, Madison); Seligman, T.H. Nov 1979. NTIS, PC A22/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

Collisions of ^{16}O with heavy targets have recently been investigated at incident energies in the range 143 to 315 MeV, from which spectra $\sigma(E')$ of outgoing fragments have been obtained. At angles larger than the grazing angle $\sigma(E')$ is found to have two peaks which clearly correspond to quasi elastic and deeply inelastic events, but at the grazing angle only a simple peak occurs, making it difficult to distinguish these two reaction mechanisms from one another in $\sigma(E')$ itself. Empirically, however, it was found that the quantity $I(E') = \ln[\sigma(E')/\sigma/\text{sub phase space}/(E')]$ appears to be more sensitive to this distinction. Even in the case of overlapping quasi-elastic components, I(E') has a structure consisting of two linear components, which may be associated with these two mechanisms. I(E') seems to sharpen the distinction between the two processes, and thus might provide a useful form for displaying the data.

6520 Nuclear Properties And Reactions, A=220 And Above

REFER ALSO TO CITATION(S) 19042, 19471, 19474, 19481, 19502

19482 (BNL—51115(Vol.2), pp 741-758) **Fission properties of very heavy nuclei produced in deep inelastic collisions.** Harrach, D.V. (Heidelberg Univ., Germany. Nov 1979. NTIS, PC A22/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

Kinematically complete experiments have been performed on the three-body exit channels in the reactions 7.5 MeV/u ^{238}U on ^{90}Zr, ^{238}U and ^{248}Cm to investigate the fission properties of nuclei with a vanishing liquid drop fission barrier. Thus far, no evidence was found for true instantaneous three-body breakup of the collision system. Instead, a seemingly sequential fission pattern in the sense of unperturbed fission fragment kinetic energies (as found before for lighter systems) is observed even for the heaviest elements. However, a considerable broadening of the fragment mass distributions as well as angular distributions incompatible with the usual saddle point concept are also observed in this region. Possible explanations in terms of non-equilibrium processes or a revision of the equilibrium liquid drop picture near instability are discussed.

19483 **(CONF-810606—26) Fission cross section measurement of ^{248}Cm.** Maguire, H.T. Jr.; Stopa, C.; Harris, D.R.; Block, R.C.; Slovacek, R.E.; Hoff, R.W.; Dabbs, J.W.T. (Rensselaer Polytechnic Inst., Troy, NY (USA); Knolls Atomic Power Lab., Schenectady, NY (USA); Lawrence Livermore National Lab., CA (USA); Oak Ridge National Lab., TN (USA)). 1981. Contract AC02-79ER10481. 5p. NTIS, PC A02/MF A01.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

The even isotopes of curium have large spontaneous fission decay rates, requiring a large neutron intensity to measure the fission cross section in the presence of a strong spontaneous fission background. The RINS (Rensselaer Intense Neutron Spectrometer) system, consisting of a 75-ton lead slowing-down spectrometer cou-

pled to the RPI Gaerttner Laboratory electron linac, produces a very intense neutron flux of broad resolution in the 1 to 100,000 eV energy range, and this system has been used to measure the fission cross section of ^{248}Cm.

19484 **(LA—8757-PR) Applied nuclear data research and development. Progress report, October 1-December 31, 1980.** Baxman, C.I.; Young, P.G. (comps.). (Los Alamos National Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 55p. NTIS, PC A04/MF A01.

Topics covered include: theory and evaluation of nuclear cross sections; nuclear cross section processing; fission products and actinides, yields, decay data, depletion and buildup. (GHT)

19485 (LBL—11599, pp 56-64) **Radioactive decay of Md isotopes.** Friedman, A.M. (Argonne National Lab., IL). 1980. NTIS, PC A04/MF A01.

From 25. anniversary of the discovery of mendelevium meeting; Berkeley, CA, USA (28 Mar 1980).

The radioactive decay of the known Md isotopes has two general characteristics which can be related to their nuclear structure. First, all of the even neutron species have a relatively small alpha branching ratio (~ 10%) and decay primarily by electron capture. Secondly, there are several known isomer pairs, all in odd neutron species. An attempt is made to determine the reasons for these empirical observations.

19486 **Neutron-rich fragments from spontaneous fission of ^{254}Cf. Chapter 5.** Selic, H.A.; Cheifetz, E.; Wolf, A. (Weizmann Inst. of Science, Rehovoth (Israel)); Wilhelmy, J.B. (Los Alamos Scientific Lab., NM (USA)). pp 316-318 of Nuclear spectroscopy of fission products. von Egidy, T. (ed.). Bristol, England; The Institute of Physics (1980).

From Workshop on the nuclear spectroscopy of fission products; Grenoble, France (21 - 23 May 1979).

Studies of even-even products of ^{254}Cf have been carried out by measurement of the γ ray de-excitation of lowest $2^+ \rightarrow 0^+$ transitions in coincidence with fission fragment kinetic energies to obtain independent fission yields as a function of fragment masses. Results of independent fission yields of already known $2^+ \rightarrow 0^+$ transitions from ^{252}Cf are compared with results obtained by spontaneous fission of ^{254}Cf and a detailed description of the product distribution in ^{254}Cf is given.

6530 Nuclear Theory

19487 (ANL—80-94, pp 99-120) **Theoretical physics.** 1980. NTIS, PC A12/MF A01.

In Physics Division annual review, 1 April 1979-31 March 1980.

The nuclear theory program deals with the properties of nuclei and with the reactions and interactions between nuclei and a variety of projectiles. The main areas of concentration are: heavy-ion direct reactions at nonrelativistic energies; nuclear shell theory and nuclear structure; nuclear matter and nuclear forces;intermediate-energy physics and pion-nucleus interactions; and high-energy collisions of heavy ions. Recent progress and plans for future work in these five main areas of concentration and a summary of other theoretical studies currently in progress or recently completed are presented.

19488 **(BNL—29137) Overview of experimental tests of the IBA.** Casten, R.F. (Brookhaven National Lab., Upton, NY (USA)). 1980. Contract AC02-76CH00016. 40p. (CONF-8009136—2). NTIS, PC A03/MF A01.

From Workshop in nuclear physics; Philadelphia, PA, USA (1 Sep 1980).

A broad overview is presented of the principal tests to date of the IBA, or both even and odd nuclei, and including the evidence concerning the possible existence of the recently proposed supersymmetries. Although some details are presented, the aim is rather to survey the principal characteristics of the model, to assess the overall quality and extent of the agreement with experiment, and to indicate where further testing would be most useful.

19489 (BNL—51115(Vol.1), pp 117-130) **Theory of intermediate energy heavy ion collisions.** Bertsch, G. (Michigan State Univ., East Lansing). Nov 1979. NTIS, PC A21/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

A theory with a framework of equations that is sufficiently flexible to describe the range of behavior possible in a heavy ion system, with parameters directly associated with the fundamental properties of the nuclear medium (such as the equation of state) is presented. (GHT)

19490 (BNL—51115(Vol.1), pp 235-271) **Fusion reactions at high energies.** Huizenga, J.R. (Univ. of Rochester, NY); Birkelund, J.R.; Tubbs, L.E.; De, J.N.; Sperber, D. Nov 1979. NTIS, PC A21/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

Experimental fusion excitation functions for heavy-ion induced reactions are compared to results calculated with a classical dynamical model employing different conservative and dissipative forces. The overall agreement between present experimental data and theory is good over the whole mass range. The theoretical fusion cross sections of the heavier systems are sensitive to the assumed forces at the higher energies. As the energy is increased, however, the onset of other reaction processes make it difficult to identify fusion and one-body dissipation is no longer valid.

19491 (BNL—51115(Vol.1), pp 445-470) **Quasielastic reactions.** Henning, W. (Argonne National Lab., IL). Nov 1979. NTIS, PC A21/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

Quasielastic reaction studies, because of their capability to microscopically probe nuclear structure, are still of considerable interest in heavy-ion reactions. The recent progress in understanding various aspects of the reaction mechanism make this aim appear closer. The relation between microscopic and macroscopic behavior, as suggested, for example, by the single proton transfer data to individual final states or averaged excitation energy intervals, needs to be explored. It seems particularly useful to extend measurements to higher incident energies, to explore and understand nuclear structure aspects up to the limit of the energy range where they are important.

19492 (BNL—51115(Vol.2), pp 513-544) **Medium energy nucleus-nucleus total reaction cross sections.** DeVries, R.M. (Los Alamos Scientific Lab., NM). Nov 1979. NTIS, PC A22/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

Exotic new effects are anticipated in the coming studies of medium and high energy heavy-ion physics. These expectations might be reasonable since such interactions are virtually unexplored. However, before the existence of exotic new phenomena can be demonstrated, it is necessary to understand the basic gross features of nucleus-nucleus (N-N) collisions, e.g. elastic scattering and total reaction cross sections (σ/sub R/). It is commonly assumed that σ/sub R/ for N-N is constant and equal to the geometric limit. This paper presents experimental and theoretical evidence against this assumption. If these findings are verified by further experimental measurements, it is likely that the view of N-N collisions in this energy region will be seriously altered.

19493 (BNL—51115(Vol.2), pp 673-711) **Heavy-ion direct-reaction mechanisms: the spectroscopic approach.** Macfarlane, M.H. (Argonne National Lab., IL). Nov 1979. NTIS, PC A22/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

Direct reactions induced by low-energy heavy ions ($E/A \leqq 10$ MeV/A) have been extensively studied over the past decade. These studies have gradually built an understanding of the detailed structure and systematic features of the structural elements - optical potentials, s-matrix elements, transition form factors and so forth - common to all direct-reaction theories. Those systematic features

are discussed and it is shown they can be used to carry out heavy-ion direct-reacion calculations with greater efficiency.

19494 (BNL—51115(Vol.2), pp 779-790) **Coupled channel effects in peripheral reactions in the closed formalism.** Frahn, W.E. (Technische Universitat, Munchen, Germany); Hussein, M.S. Nov 1979. NTIS, PC A22/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

The closed formalism for heavy-ion elastic, inelastic and transfer reactions is generalized to include coupled-channels effects. The radial Gell-Mann-Goldberger equation is used to obtain perturbative corrections to the normal amplitudes. These corrections are, in principle, completely determined by the normal elastic amplitude provided the coupling strengths to the different channels that give rise to these corrections are predetermined experimentally. All the corrections are evaluated in closed form. This aspect of the theory, i.e., the dynamical relation between the different amplitudes, is particularly emphasized in connection with the application of the formalism to discuss heavy-ion elastic, inelastic and transfer data at backward angles.

19495 (BNL—51115(Vol.2), pp 791-800) **Multiple coulomb excitation effects in the HI Coulomb polarization potential.** Hussein, M.S. (Univ. of Wisconsin, Madison); Canto, L.F.; Donangelo, R. Nov 1979. NTIS, PC A22/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

The coupled channel radial equations for multiple Coulomb excitations are used to derive the Coulomb polarization potential in the elastic channel. The potential is explicitly calculated up to fourth order in the coupling and the resulting expression is used to obtain the elastic scattering cross section in the WKB approximation. The results account reasonably well for the data on ^{20}Ne + ^{148}Sm, ^{150}Sm and ^{152}Sm at E/sub Lab/ = 70 MeV. Including higher-order effects in the potential is straightforward.

19496 (BNL—51115(Vol.2), pp 833-860) **Heavy-ion reactions leading to continuum spectra.** Nagatani, K. (Texas A & M Univ., College Station). Nov 1979. NTIS, PC A22/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

A project dealing with reactions leading to continuum energy spectra is discussed. The emphasis in this project is on understanding the reaction mechanism quantitatively in terms of quantum mechanical treatments in a microscopic picture. Theoretical analyses are made using the DWBA theory together with the shell model.

19497 (BNL—51115(Vol.2), pp 877-882) **Decay of a hot zone in heavy ion reactions.** Garpman, S.I.A.; Sperber, D.; Zielinska-Pfabe, M. (Rensselaer Polytechnic Inst., Troy, NY). Nov 1979. NTIS, PC A22/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

The emission of nucleons from a localized hot zone possibly formed in the early stage of heavy ion reaction at intermediate energies (10 MeV/A to 100 MeV/A) was studied.

19498 (BNL—51115(Vol.2), pp 883-895) **Study of heavy-ion collisions in terms of nuclear hydrodynamics.** Tang, H.H.K. (Yale Univ., New Haven, CT). Nov 1979. NTIS, PC A22/MF A01.

From Symposium on heavy ion physics from 10-200 MeV/A; Upton, NY, USA (16 Jul 1979).

Among the most important motivations for recent interest in medium- and high-energy heavy-ion reactions are the probing of the equation of state of nuclear matter, the possible study of nuclear systems at high densities and temperatures and their manifestations in exotic phenomena such as pion condensation and shape isomers. For many such investigations, nuclear hydrodynamics appears to provide an appropriate framework. However, for the validity of nuclear hydrodynamics it is crucial that the interaction time be long compared with the time necessary to bring the system into local equilibrium. Head-on collisions involving large nuclei present the most favorable cases where nuclear hydrodynamics may provide a valid description for the reaction process. Accordingly, a critical test of nuclear hydrodynamics will be the confrontation of theoretical predictions and experiments for head-on and near-head-on collisions.

19499 **Brueckner-Beths calculations of nuclear matter.** Day, B.D. (Argonne National Lab., IL (USA)). pp 1-36 of Meson theory of nuclear forces and nuclear matter. Scientific report. Schuette, D.; Holinde, K.; Bleuler, K. (eds.). Mannheim, Germany, F.R.; Bibliographisches Institut (1980).

From Topical meeting on the Meson Theory of Nuclear Forces; Bad Honnef, F.R. Germany (12 Jun 1979).

The Brueckner-Bethe method is described and some recent results are given for nuclear matter. The results make it plausible that present Brueckner-Bethe calculations can locate the saturation point with an uncertainty of 2-3 MeV in energy and roughly 0.1 fm^{-1} in k/sub F/. The full Reid potential is found to saturate at about the right energy but somewhat too high a density.

19500 **Meson theory of nuclear forces and nuclear matter. Scientific report.** Schuette, D.; Holinde, K.; Bleuler, K. (eds.). Mannheim, Germany, F.R.; Bibliographisches Institut (1980). vp. (CONF-7906141—).

From Topical meeting on the Meson Theory of Nuclear Forces; Bad Honnef, F.R. Germany (12 Jun 1979).

Papers from this meeting were processed individually for the data base as they were received from INIS. (RWR)

6540 Radiation And Shielding Physics

REFER ALSO TO CITATION(S) 19002, 19428, 19484, 19602

19501 (ANL—80-94, pp 87-98) **Neutron and photonuclear physics.** 1980. NTIS, PC A12/MF A01.

In Physics Division annual review, 1 April 1979-31 March 1980.

The Argonne neutron-physics program has traditionally included measurements of the fundamental properties of the neutron. An experiment to measure the electric dipole moment of the neutron using stored ultracold neutrons has been undertaken. It is hoped that a sensitivity of around 1 x 10^{-25} e-cm will be attained by the end of 1981. This will provide a test of the Weinberg-Salam standard model in the gauge theory of weak interactions. The photoneutron research program at Argonne is centered around studies of non-El giant resonances in nuclei, basic reaction mechanisms in light nuclei and fundamental properties of the deuteron. The importance of the photoneutron method lies in its ability to reach regions of excitation in nuclei which are inaccessible by other traditional neutron-induced reactions. Much of the effort during this year was devoted to the completion and testing of a new multidirectional electron beam transport system. This new system not only permits more accurate spin assignments of resonances, but also enables an accurate measurement of the relative angular distribution for the photodisintegration of the deuteron. Some of our effort has also involved the study of the systematic errors one encounters when performing such accurate angular distribution measurements. In addition an exhaustive search for the M1 giant resonance in ^{208}Pb below 8.4 MeV was completed. This study employed the extended neutron flight paths. Another area of the photonuclear program involves photon scattering from medium- and heavy-weight nuclei. Observations of inelastic photon scattering from vibrational nuclei provide information about the coupling between two collective modes of nuclear excitation.

19502 **(HEDL-TME—79-58) Interlaboratory reaction rate program. 12th progress report, November 1976-October 1979.** Lippincott, E.P.; McElroy, W.N.; Preston, C.C. (comps.). (Hanford Engineering Development Lab., Richland, WA (USA)). Sep 1980. Contract AC14-76FF02170. 279p. NTIS, PC A13/MF A01.

The Interlaboratory Reaction Rate UILRR) program is establishing the capability to accurately measure neutron-induced reactions and reaction rates for reactor fuels and materials development programs. The goal for the principal fission reactions, ^{235}U,

^{238}U and ^{239}Pu, is an accuracy to within +- 5% at the 95% confidence level. Accurate measurement of other fission and nonfission reactions is also required, but to a lesser accuracy, between +- 5% and 10% at the 95% confidence level. A secondary program objective is improvement in knowledge of the nuclear parameters involved in the standarization of fuels and materials dosimetry measurements of neutron flux, spectra, fluence and burnup.

19503 **(LA—8731-M) Small Sample Assay Station users guide.** Adams, E.L.; Bourret, S.; Meier, M.M. (Los Alamos Scientific Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 26p. NTIS, PC A03/MF A01.

A system for acquisition of delayed neutron data, based on an LSI-11 with 28 K words of memory, is described. Hardware features are a six-channel scaler and level sensor to determine the state of the experiment; and normal peripherals include dual floppy-disk drive, line printer, and CRT terminal. The software for experiment control and for the analysis of data is presented. The protocol for assays that optimally utilize the system is suggested.

19504 **(UCRL—84847) Methods and procedures for evaluation of neutron-induced activation cross sections.** Gardner, M.A. (Lawrence Livermore National Lab., CA (USA)). Sep 1981. Contract W-7405-ENG-48. 34p. (CONF-800979—15). NTIS, PC A03/MF A01.

From Workshop on nuclear data evaluation methods and procedures; Upton, NY, USA (22 Sep 1980).

One cannot expect measurements alone to supply all of the neutron-induced activation cross-section data required by the fission reactor, fusion reactor, and nuclear weapons development communities, given the wide ranges of incident neutron energies, the great variety of possible reaction types leading to activation, and targets both stable and unstable. Therefore, the evaluator must look to nuclear model calculations and systematics to aid in fulfilling these cross-section data needs. This review presents some of the recent developments and improvements in the prediction of neutron activation cross sections, with specific emphasis on the use of empirical and semiempirical methods. Since such systematics require much less nuclear informaion as input and much less computational time than do the multistep Hauser-Feshbach codes, they can often provide certain cross-section data at a sufficient level of accuracy within a minimum amount of time. The cross-section information that these systematics can and cannot provide and those cases in which they can be used most reliably are discussed.

6550 Medical Physics

REFER ALSO TO CITATION(S) 19145, 19147, 19150, 19212, 19287

19505 (DOE/EV/04326—3, pp III.1-III.19) **Development of a calibration phantom structure for determining activity deposited in the thoracic skeleton.** 1980. NTIS, PC A08/MF A01.

In In vivo measurements of bone-seeking radionuclides. Progress report, 1977-1980.

This paper discusses the development of a calibration phantom for the specific application to in vivo measurements of low energy, photon-emitting nuclides. The one phantom structure that has not yet been developed has been for radioactive material deposited on the surface or within the skeletal structure. In the present study, a thoracic skeletal phantom was designed and constructed. (KRM)

19506 (DOE/EV/04326—3, pp V.1-V.24) **Low energy, photon emitting nuclides: reference spectra library.** 1980. NTIS, PC A08/MF A01.

In In vivo measurements of bone-seeking radionuclides. Progress report, 1977-1980.

This section presents a reference library consisting of the measured spectral response of the NaI(Tl)-CsI(Tl) detector to individual low energy photon-emitting nuclides in a point source geometry. The reference spectra collection will be limited to radionuclides which emit photons in the energy range below 20 keV. (KRM)

6560 Solid State Physics

19507 **(CONF-8006158—1) Theoretical evidence for specificity of metal-metalloid interactions in Fe-Ni-P-B glasses.** Messmer, R.P. (General Electric Co., Schenectady, NY (USA). Research and Development Center). 1980. Contract AC02-79ER10382. 5p. NTIS, PC A02/MF A01.

From Conference on metallic glasses: science and technology; Budapest, Hungary (Jun 1980).

Detailed quantum mechanical calculations are carried out on clusters of atoms which simulate possible local environments in amorphous metal alloys. The clusters used are based on simple Bernal polyhedra and distortions of these polyhedra. The materials being studied are the (Fe, Ni, B, P) alloys. The simplest Bernal polyhedron, the tetrahedron, is considered as a first model for the local environment in $Fe_{40}Ni_{40}B_{20}$ and $Fe_{40}Ni_{40}P_{20}$ alloys.

19508 **Thermodynamics of adsorption at interfaces as it influences decohesion.** Hirth, J.P. (Ohio State Univ., Columbus); Rice, J.R. Contract EY-76-S-02-3084. *Metallurgical Transactions, [Section] A: Physical Metallurgy and Materials Science ;* **11**: No. 9, 1501-1511(Sep 1980).

Earlier computations on the work of separation of boundaries with adsorbed solute atmospheres are reconsidered in terms of reversible work cycles. Special attention is given to two limiting cases. These are the separation of a material interface under fully equilibrated conditions, for which the chemical potential of the adsorbed solute remains constant, and separation under constrained conditions for which the surface excess solute concentration remains constant (i.e., the same on the two newly created free surfaces as present initially on the unstressed interface). The results are consistent with the limiting cases treated before and include the extension to more general cases of solute interactions, including multicomponent systems. The work terms are conveniently represented on diagrams of chemical potential vs surface excess solute concentration. A general separation process is then represented as a path in this diagram which begins on the adsorption isotherm for the unstressed interface and ends on the adsorption isotherm for the pair of newly created surfaces.

6570 Theoretical Physics

REFER ALSO TO CITATION(S) 19064

19509 **(LA—8789-T) Restrictions on relativistically rotating fluids.** Schendel, J.R. (Los Alamos Scientific Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 94p. NTIS, PC A05/MF A01.

Thesis.

A set of inequalities which apply to the surface of rigidly rotating, perfect fluids with asymptotically flat exteriors is derived. This set consists of both algebraic inequalities and inequalities which involve integrals performed over the surface of the fluid. The physical content of these inequalities is investigated by examining the restrictions they impose on the existence of rotating fluid models with Kerr interiors. For this case, the dominant set of inequalities is found and expressed in an analytic form. These restrictions impose a finite maximum redshift between observers on the surface and at infinity for all models with the Kerr parameter $a > m$. However, for all models with $0 < a/m \leqq 1$, there is a unique configuration for which the redshift is unbounded. In the static limit, $a \rightarrow 0$, a finite maximum redshift depending on the matter distribution of the static background is found. This result is compared to stability requirements for non-rotating fluids. The implications of this comparison and areas for future extensions are discussed.

70 FUSION ENERGY

7001 Plasma Research

REFER ALSO TO CITATION(S) 19435, 19556

19510 (UCRL-Trans—11672) Transverse diffusion of plasma in/on the disintegration of drift surfaces in axially asymmetric plasma traps. Lysyanskii, P.B.; Tiunov, M.A. (AN SSSR, Novosibirsk. Inst. Yadernoj Fiziki). [nd]. Translation of Preprint 80-94. 13p. NTIS, PC A02/MF A01.

Adiabatic motion of a charged particle in an open magnetic trap with axially asymmetric mirrors and a section of the longitudinal field in the central portion is discussed. In moving between the magnetic mirrors a particle intersects the median plan of the trap, which is orthogonal to the magnetic field in the center of the system. We will follow the movement of the point of intersection of this plane by the leading center of the particle (depicting point). The values of the Larmor particle radius rho/sub i/ and the pitch angle relate to this plane.

19511 (UCRL-Trans—11674) Plasma stability and potential distribution in the Thermal barrier of an ambipolar trap. Pekker, L.S. (AN SSSR, Novosibirsk. Inst. Yadernoj Fiziki). [nd]. Translation of Preprint 80-161. 13p. NTIS, PC A02/MF A01.

The ion distribution function in the barrier (intermediate) mirrors is anistropic. This may lead to development of instability, as a result of which the ion distribution function rapidly becomes isotropic, plasma accumulates in the barrier mirror and the thermal barriers are disrupted. The instability is numerically followed for all angles θ and θ_0. A boundary is found and the maximum increment of instability is calculated as a function of the mirror ratio for the model dependence of the barrier potential on the electron temperature. The stabilizing influence of captured ions on the development of instability is also discussed. The distribution of potential and density of the plasma in the barrier mirrors is also discussed. It is shown that the potential changes jumpwise at the magnetic field in transition from the central mirror to the barrier mirror.

19512 (ANL/FPP/TM—142) Plasma sheath region near a boundary with positive ion backscattering. Brooks, J.N. (Argonne National Lab., IL (USA)). Apr 1981. Contract W-31-109-ENG-38. 22p. NTIS, PC A02/MF A01.

The sheath region at a boundary perpendicular to a magnetic field has been studied by numerically solving time-independent Vlasov-Poisson equations for a DT plasma. Boundary conditions are specified for particles entering the sheath region and for particles returning from the boundary. The effect of hydrogen ion backscatter as well as electron reemission has been examined. For a space-charge limited electron reemission condition, even a small amount of ion backscatter can change the sheath parameters substantially, lowering the sheath potential and increasing the heat transmission. This could be important in lowering the edge temperature, and the sputtering rate in future fusion devices.

19513 (CONF-810415—5) Finite-orbit method for dynamic analysis of mirror fusion systems. Campbell, M.M.; Miley, G.H. (Illinois Univ., Urbana (USA). Fusion Technology Lab.). 1981. Contract AS02-76ET52040. 20p. NTIS, PC A02/MF A01.

From ANS/ENS joint topical meeting on mathematical methods in nuclear engineering; Munich, F.R. Germany (27 Apr 1981).

A model (FOREMD) is described which treats plasma buildup in small mirror fusion devices where finite gyroradius effects are important to the dynamic evolution of the density and energy profiles. An energy-dependent group technique is employed, but unlike conventional point-kinetic diffusion models, the local density is calculated by a summing over orbits passing through the volume of interest. This treatment is particularly important during buildup via neutral beam injection where charge-exchange losses near the surface affect the inner-volume density distribution through loss of large orbit ions. As an example of the use of FOREMD, buildup processes in two experimental devices (2X-IIB and TMX) are examined.

19514 (DOE/ET/53006—7) Extreme ultraviolet and soft x-ray diagnostics of high-temperature plasmas. Annual progress report, October 1, 1980-September 30, 1981. Moos, H.W.; Armstrong, L. Jr. (Johns Hopkins Univ., Baltimore, MD (USA)). 1981. Contract AS02-76ET53006. 27p. NTIS, PC A03/MF A01.

The work performed from May 1980 through March 1981 is described. EUV diagnostic studies have been performed at the Alcator A, Alcator C and TFR 600 tokamaks and on TMX. The central molybdenum concentration in Alcator C has been shown to be much lower than that in Alcator A. Impurity concentration and radiative power losses have been determined in the center cell of TMX. A grazing incidence spectrograph with 1024 detector elements is under construction.

19515 (DOE/ET/53007—1) Ion confinement in laser-initiated vacuum arcs and advanced thermonuclear fuel studies. Final report, April 15, 1977-February 15, 1981. Hirshfield, J.L. (Yale Univ., New Haven, CT (USA). Dept. of Engineering and Applied Science). Mar 1981. Contract AS02-77ET53007. 11p. NTIS, PC A02/MF A01.

Experimental investigations were carried out of magneto-electrostatic confinement in laser-initiated vacuum arcs. Over a range of laser powers and discharge currents, inhibition in escape of energetic C^+-C^{4+} ions was observed simultaneously in several directions. The ion confinement was observed to scale with the energy of the laser produced ions and the discharge voltage (i.e. anode sheath voltage). A numerical code was developed for determining fast proton coulomb slowing in a hot target plasma of lithium, boron, or berillium. This code showed that, under very optimistc conditions, F values in excess of unity appear possible for a catalyzed p-^{6}Li two component reactor.

19516 (DOE/ET/53018—5) Computer modeling of theta-pinch behavior with plasma-column rotation. McCowan, J.R.; Klevans, E.H.; York, T.M.; Heidrich, J.E. (Pennsylvania State Univ., University Park (USA)). Jan 1981. Contract AS02-76ET53018. 16p. NTIS, PC A02/MF A01.

Radial pressure contributed by plasma column rotation is included in a zero-dimensional, time-dependent computer model used to describe post-implosion behavior of a linear theta pinch device modeled with a diffuse density profile. When the parameter $\alpha = m/\text{sub i/}\ {}^2a^2/2T > 1$, where m_i is the ion mass, ω is the rotation frequency, a is the plasma radius, and T = T/sub i/ + ZT/sub e/ is the plasma temperature, rotational pressure results in a suppression of the internal magnetic field. This leads to an increase in the rate of flux diffusion and ohmic heating. The predictions of the computer simulations agree favorably with results of one experiment characterized by $\alpha = 1.08$ and indicate that rotation is important in accounting for observed electron temperature behavior.

19517 (DOE/ET/53088—10) Necessary stability condition for field-reversed theta pinches. Cary, J.R. (Texas Univ., Austin (USA). Inst. for Fusion Studies). Mar 1981. Contract FG05-80ET53088. 18p. NTIS, PC A02/MF A01.

Toroidal systems of arbitrary cross section without toroidal magnetic field are analyzed via the double adiabatic fluid equations. Such systems are shown to be unstable if there exists one closed field line on which the average of $\kappa r B^2$ is positive, where κ is the curvature. A similar criterion is derived for linear systems and is applied to a noncircular z-pinch.

19518 (DOE/ET/53088—11) Magnetic trapped particle modes. Rosenbluth, M.N. (Texas Univ., Austin (USA). Fusion Research Center). Mar 1981. Contract FG05-80ET53088. 13p. NTIS, PC A02/MF A01.

It is shown that very low frequency magnetic modes may be unstable for systems such as tandem mirrors which contain plasma trapped in regions of unfavorable curvature. Onset of the instability occurs when the diamagnetic plasma pressure is sufficient to reverse particle drift velocities.

19519 (GA-A—16243) MBC, a ballooning stability code for finite toroidal mode number. Moore, R. (General Atomic Co., San Diego, CA (USA)). Mar 1981. Contract AT03-76ET51011. 26p. NTIS, PC A03/MF A01.

The General Atomic Company ballooning mode stability code MBC calculates the stability of numerically-generated tokamak equilibria to ideal MHD pressure-driven modes for finite toroidal mode number. This report gives a summary of the input and output used by MBC.

19520 **(NRL-MR—4504) Numerical simulation of tokamak electron dynamics.** Miner, W.H.; Winsor, N.K.; Bernstein, I.B. (Naval Research Lab., Washington, DC (USA)). 29 Apr 1981. Contract AI01-76ET28382. 36p. NTIS, PC A03/MF A01.

In a tokamak, the electron distribution deviates from a Maxwellian. This is because the magnetically untrapped electrons moving parallel to the applied electric field tend to run away. Because of the presence of trapped electrons, the distribution also departs from the Chapman-Enskog solution of the weak electric field problem. Previous analytic and numerical methods have treated this distortion in the limit of vanishingly small electric fields, a vanishing small number of trapped electrons, or both. We present a numerical method which relaxes these limitations, and illustrate the distribution functions which result from it.

19521 **(ORNL/TM—7678) Equilibrium evolution on the resistive time scale in a tokamak reactor.** Holmes, J.A.; Peng, Y.K.M.; Rothe, K.E. (Oak Ridge National Lab., TN (USA)). Apr 1981. Contract W-7405-ENG-26. 29p. NTIS, PC A03/MF A01.

In the Engineering Test Facility (ETF) the plasma pulse duration is expected to be hundreds of seconds, which is comparable to the resistive time scale that governs the resistive diffusion of the equilibrium. The resistive evolution of the safety factor q profile may, for MHD stability reasons, limit the duration of the plasma burn in a tokamak reactor. It may be possible to control this evolution and extend the plasma burn time through proper profile tailoring. We study the evolution of the q profile on the resistive time scale numerically using a one-and-one-half-dimensional (1 1/2-D) single fluid transport code. Two high beta (anti β/sub T/ $\sim$ 7 to 16%) cases are considered: (1) a beam-driven hydrogen plasma with no nuclear alpha heating for which the beam energy is used as a device to control the tempature profile, and (2) an ignited D-T plasma in which the neutral injection has been turned off.

19522 **(PPPL—1758) Narrow H-alpha emission profiles in tokamaks: molecular origin and observational effects.** McNeill, D.H. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Apr 1981. Contract AM02-76CH03073. 21p. NTIS, PC A02/MF A01.

The narrow hydrogen Balmer alpha profiles observed in tokamaks are explained in terms of the slow ($\sim$ 0.3 eV) and fast (2 to 6 eV) excited atoms formed by dissociation of molecular hydrogen at the plasma edge. Extra widening of the spectrum in the wings can be explaind by Zeeman split H-alpha that is reflected from the vacuum vessel. This interpretation is consistent with available high-resolution data. The use of H-alpha as a diagnostic is discussed briefly.

19523 **(PPPL—1764) Calculation of the statistical properties of strange attractors.** Jensen, R.V.; Oberman, C.R. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Apr 1981. Contract AM02-76CH03073. 20p. NTIS, PC A02/MF A01.

A path integral method is developed for the calculation of the statistical properties of a class of discrete, dissipative mappings which exhibit strange attractors. Exact analytic results are derived for the low order statistical moments. These non-trivial results are verified numerically.

19524 **Particle confinement in asymmetric-cell multiple-mirror systems.** Post, R.F. (California Univ., Livermore (USA). Lawrence Livermore National Lab.); Xing Zhong Li (Southwestern Institute of Physics, Leshan, Scihuan, People's Republic of China). *Nuclear Fusion ;* **21**: No. 2, 135-144(Feb 1981).

The enhancing effect of asymmetry in the particle capture and loss processes in a multiple-mirror system is analysed. The system considered consists of a central mirror confinement region 'plugged' at each end by N smaller-volume mirror cells. It is shown that the effective confinement time in the central cell increases exponentially with N with asymmetric cells, as contrasted with previous analyses which showed an increase linear in N for plugging cells characterized by symmetric capture and loss processes.

19525 **(UCID—18876) Line shapes for some specific transitions in Hydrogenic, Lithium-like, and Helium-like ions.** Lee, R.W. (Lawrence Livermore National Lab., CA (USA)). 29 Dec 1980. Contract W-7405-ENG-48. 28p. NTIS, PC A03/MF A01.

A set of computer codes have been developed to produce spectral line shapes of highly stripped ions for a number of transitions in Hydrogenic, Helium-like and Lithium-like species. The choice of the transitions has been dictated largely by the laser compression experiments. The transitions of Hydrogenic species are: Lyman α; Lyman β; Lyman γ; Lyman δ; Balmer α; and Balmer β. The transitions of Helium-like species are: $1s^2(^1S_0)$-$1s2p(^1P)$; $1s^2(^1S_0)$-$1s3p(^1P)$; $1s^2(^1S_0)$-$1s4p(^1P)$ and the associated dipole-forbidden components. The transitions of Lithium-like species are the entire n = 2 to n = 3 and n = 4 complexes.

19526 **(UCRL—85480) Microprocessor-controlled data-acquisition instrument for neutron-activation measurements.** Jones, B.A. (Lawrence Livermore National Lab., CA (USA)). 1981. Contract W-7405-ENG-48. 8p. (CONF-810523—1). NTIS, PC A02/MF A01.

From Topical conference on computerized data acquisition in particle and nuclear physics; Oak Ridge, TN, USA (28 May 1981).

This paper describes a microprocessor controlled data acquisition instrument designed at Lawrence Livermore National Laboratory to provide experimenters with a diagnostic tool for measuring the performance of laser imploded fusion targets via neutron activation techniques. This instrument features the ability to count four independent inputs simultaneously while providing a front panel readout of these inputs, plus a time of day clock. A hardcopy printout of the data is also provided by a built-in thermal printer. All running modes and parameters are user selectable via a front panel keypad, and a complete set of internal self-testing diagnostics are available for debug.

19527 **Non-linear Fokker-Planck studies of RF current drive efficiency.** Harvey, R.W. (General Atomic Co., San Diego, CA (USA)); Marx, K.D.; McCoy, M.G. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). *Nuclear Fusion ;* **21**: No. 2, 153-157(Feb 1981).

A two-dimensional, non-linear Fokker-Planck code coupled to a quasi-linear diffusion term is used to calculate the ratio of RF current excited to power consumed by travelling waves in the plasma. Transport loss of electron energy is simulated according to a model of stochastic-magnetic-field effects. Results are obtained for waves with phase velocity normalized to electron thermal velocity in the range from 0.175 to 4.0. Scaling to a tokamak reactor is considered.

19528 **Coupled radial and thermal fluctuations of ignited tokamak plasmas.** Bromberg, L.; Cohn, D.R. (Massachusetts Inst. of Tech., Cambridge (USA). Plasma Fusion Center; Oak Ridge National Lab., TN (USA)). *Nuclear Fusion ;* **21**: No. 2, 201-208(Feb 1981).

The coupling between radial motion and temperature fluctuations of an ignited D-T tokamak plasma is studied in terms of a one-dimensional transport model. The energy balance equations are linearized about the thermal equilibrium (i.e. ignition) point and an eigenvalue analysis is used to determine the growth rate of perturbations. If the density dynamics is relatively slow, it is found that there is, at most, one growing eigenmode. The growth rate of temperature perturbations and the extent of radial movement depend upon a parameter etasub(r) which describes the elasticity of radial motions (etasub(r)=T/R dR/dT, where R is the major radius and T is the plasma temperature). A simple MHD model is used to determine the dependence of etasub(r) upon the vertical field index (eta=-R/Bsub(v)dBsub(v)/dR) and the poloidal beta. The implications of different empirical scaling laws for the electron energy confinement time are examined. Similar values of etasub(r)(etasub(r)

approximately 0.2) can be obtained for representative ETF/INTOR and ignition test reactor (ITR) parameters. For etasub(r) approximately 0.2 the effect of radial motion is to reduce the central ion temperature needed for thermal stability from approximately 50 to approximately 35 keV if the electron energy confinement time scales as tausub(e) approximately na^2; at lower temperatures (central ion temperatures approximately 10-20 keV), the thermal runaway time is increased by a factor approximately 2 to 3. It is pointed out that if the plasma edge is determined by some type of limiter at the midplane, small temperature fluctuations can significantly change the plasma minor radius; active burn control may be needed in some reactor designs to prevent unacceptably large radial movement in addition to providing constant plasma pressure and temperature.

19529 **Axial potential profiles in thermal-barrier cells.** Cohen, R.H. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). *Nuclear Fusion ;* **21**: No. 2, 209-214(Feb 1981).

The potential profile in the vicinity of the throat of a tandem-mirror thermal-barrier cell is studied. A model ion distribution function which resembles that obtained from numerical Fokker-Planck code studies is used. For all but very small ratios of trapped- to passing-particle densities, the self-consistent potential satisfies quasi-neutrality and varies gradually between its value just beyond the throat and a depressed value in the interior of the barrier cell. As the trapped-particle density decreases, a sheath develops at a finite distance from the mirror throat. For still lower trapped-particle densities, the throat region ceases to be quasi-neutral; the solution to Poisson's equation is a sheath-like structure whose height depends on the net charge density at the throat, which, in turn, is determined by the requirement that the solution match smoothly to the profile in the adjacent cell.

19530 **(UCRL-Trans—11670) Trap with ambipolar plugs.** Dimov, G.I.; Roslyakov, G.V. (Lawrence Livermore National Lab., CA (USA)). Feb 1981. Translation of Preprint 80-152, 1980. 103p. NTIS, PC A06/MF A01.

The following chapters are included: (1) longitudinal confinement of plasma by ambipolar fields in open traps, (2) proposals for improving the trap with ambipolar plugs, (3) the energy balance of a trap in the classical approximation, (4) plasma stability in the trap, (5) transverse diffusion of plasma, (6) experimental facilities and findings, and (7) thermonuclear reactors based on ambipolar traps. (MOW)

19531 **Maxwell-Vlasov equations as a continuous Hamiltonian system.** Morrison, P.J. (Princeton Univ., NJ (USA). Plasma Physics Lab.). *Physics Letters, [Section] A ;* **80**: No. 5/6, 383-386(22 Dec 1980).

The well-known Maxwell-Vlasov equations that describe a collisionless plasma are cast into hamiltonian form. The dynamical variables are the physical although noncanonical variables E, B and f. We present a Poisson bracket which acts on these variables and the energy functional to produce the equations of motion.

19532 **Tracer element injection into PDX tokamak for spectral line identification and localized Doppler temperature measurement.** Suckewer, S.; Cecchi, J.; Cohen, S.; Fonck, R.; Hinnov, E. (Princeton Univ., NJ (USA). Plasma Physics Lab.). *Physics Letters, [Section] A ;* **80**: No. 4, 259-262(8 Dec 1980).

Magnetic dipole lines in ScXIII-XVII and resonance lines of ScXVIII-XIX were observed and identified. Advantages of ion thermometry by mean tracer element injection are described.

19533 **Beam-plasma instabilities in a strongly coupled plasma.** Golden, K.I. (Northeastern Univ., Boston, MA (USA). Dept. of Electrical Engineering); Kalman, G. (Boston Coll., Chestnut Hill, MA (USA). Dept. of Physics; Boston Coll., Chestnut Hill, MA (USA). Center for Energy Research); Hammerling, P. (La Jolla Inst., CA (USA)). *Physics Letters, [Section] A ;* **80**: No. 2/3, 149-152(24 Nov 1980).

We adopt a model hydrodynamic-like dispersion relation to describe the interaction of a high density strongly coupled electron plasma. Growth rate expressions are derived.

19534 **Fusion by magnetic mirror confinement.** Fowler, T.K. (California Univ., Livermore (USA). Lawrence Livermore Lab.). *Revue Generale Nucleaire ;* No. 6, 552-561(Nov-Dec 1980). (In French).

In this work, the author describes the principles of the tandem mirror which, since the midseventies, has revolutionised the possibilities of fusion by magnetic mirror effect. Following an account of the initial results obtained by this type of installation, he gives an account of a fusion test center at present being developed at Livermore (USA) which will be based on a tandem mirror arrangement (MFTF-B). He concludes with a description of the 'promising' concept of the field reversed mirror, another variant of mirror configuration.

19535 **(LA-UR—78-2293) Kelvin-Helmholtz-like instability of a shear layer subject to free boundary conditions.** Mjolsness, R.C. (Los Alamos Scientific Lab., NM (USA)). [nd]. Contract W-7405-ENG-36. 9p. NTIS, PC A02/MF A01.

For free boundary conditions a shear layer with linear velocity profile supports irrotational disturbances, one mode being unstable when its wavelength lambda $>$ 2.619 times the thickness h of the shear layer. For long wavelengths the dispersion relation of the mode approaches Kelvin-Helmholtz form.

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REFER ALSO TO CITATION(S) 18706, 18904, 18957, 18984, 19076, 19077, 19078, 19079, 19080, 19525, 19526

19536 **(UCRL-Trans—11673) Gas efficiency of surface-plasma sources of negative hydrogen ions.** Apolonskii, A.N.; Bel'chenko, Yu.I.; Dimov, G.I.; Dudnikov, V.G. (AN SSSR, Novosibirsk. Inst. Yadernoj Fiziki). [nd]. Translated from Preprint 80-17. 9p. NTIS, PC A02/MF A01.

Ionization sensors with compensation for noise from plasma discharges were to measure the flows of hydrogen exiting through emission slots of surface-plasma sources of negative hydrogen ions (SPS's) operating in pulse modes. In the ignition of high-current discharges in an SPS with planotron geometry the hydrogen current density in the plane of the emission slot decreases from the starting value of 2 to 4 x 10^{20} at/cm^2.s needed for ignition of discharge with cold cathodes to 0.8 to 1 x 10^{20} at/cm^2.s Under optimum conditions the flow of H^- ions formed in the beam is up to 30% of the total hydrogen current existing through the emission slot.

19537 **(ANL/FPP/TM—143) Tokamak reactor studies.** Baker, C.C. (Argonne National Lab., IL (USA)). Jan 1981. Contract W-31-109-ENG-38. 71p. NTIS, PC A04/MF A01.

This paper presents an overview of tokamak reactor studies with particular attention to commercial reactor concepts developed within the last three years. Emphasis is placed on DT fueled reactors for electricity production. A brief history of tokamak reactor studies is presented. The STARFIRE, NUWMAK, and HFCTR studies are highlighted. Recent developments that have increased the commercial attractiveness of tokamak reactor designs are discussed. These developments include smaller plant sizes, higher first wall loadings, improved maintenance concepts, steady-state operation, non-divertor particle control, and improved reactor safety features.

19538 **(BNL—28899) Neutron-transport equation in a general curvelinear coordinate system.** Takahashi, H. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 5p. (CONF-810606—24). NTIS, PC A02/MF A01.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

Different from a fission reactor, a fusion reactor has complex geometry, such as toroidal geometry. Neutron transport equation for the toroidal coordinate system has been derived by using coordinate transformation from the cartesian coordinate. These methods require rather tedious calculations. Presented here is a simple method to formulate the neutron transport equation in the general

curvelinear coordinate system. The equations for parabolic cylinder and toroidal coordinate systems are derived as an example.

19539 **(BNL—28903) Results of parametric neutronic studies for high-temperature blankets with breeding.** Makowitz, H.; Lazareth, O.W.; Powell, J.R.; Fillo, J.A. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 5p. (CONF-810606—10). NTIS, PC A02/MF A01.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

Previous conceptual studies have been extended to examine a wide range of possible blanket configurations. The overall goals of this study have been to achieve neutronically viable blanket combinations that obtain an average breeding ratio (BR) of at least 1.1 and a sufficiently high fraction of fusion energy, Q/sub FRAC//sup HI/ (20% HTE High Temperature Heat) in the HTE process steam. The present studies have converged on the most attractive blanket option. After a preliminary and a secondary round of parametric calculations, ZrO_2 was selected as the best ceramic material; and a shell design with a flux trap type of back breeding zone with a Zr or Graphite plug, was chosen as optimal for the HTE module.

19540 **(BNL—51368) BNL neutral beam development group. Progress report FY 1980.** Prelec, K.; Sluyters, T. (Brookhaven National Lab., Upton, NY (USA)). 15 Jan 1981. Contract AC02-76CH00016. 14p. NTIS, PC A02/MF A01.

The objective of the BNL Neutral Beam Program is to develop a 250 keV neutral beam system suitable for heating and other experiments in toroidal or mirror plasma devices. The system is based on acceleration and neutralization of negative hydrogen ions produced in and directly extracted from a source. The objective of source studies is to develop a module delivering 10 A of negative ion currents, with pulse lengths ranging from several seconds duration up to a steady-state operation. The extracted current density should be several hundred mA/cm^2, and the source should operate with power and gas efficiencies acceptable from the beam line point of view. The objective of beam extraction and transport studies is to design a system matching the 10 A source module to the acceleration stage. The 250 keV acceleration studies cover several options, including a d.c. close-coupled system, a large aperture d.c. system matched to the source by a bending magnet, a multiaperture d.c. system following a multiaperture strong focusing transport line, and a MEQALAC structure.

19541 **(DOE/DP/40030—2) Inertial fusion research. Annual technical report, 1979.** Henderson, T.M. (ed.). (KMS Fusion, Inc., Ann Arbor, MI (USA)). 1979. Contract AC08-78DP40030. 186p. NTIS, PC A09/MF A01.

Separate abstracts were prepared for each of the 4 included sections. (M0W)

19542 (DOE/DP/40030—2, pp 2.1-2.34) **Laser fusion experiments.** 1979. NTIS, PC A09/MF A01.

In Inertial fusion research. Annual technical report, 1979.

In the past year, experimental efforts to investigate the effects of shorter wavelength irradiations have been continued. The 0.53 μm green experiments are already showing some expected (and beneficial) coronal behavior. Because reactor size pellets will be large, therefore necessitating long density gradients, experiments have begun to examine Brillouin backscatter from a long density gradient gas target. In continuing efforts to understand quantitatively the spherical shell implosion process, both simple models and more complete hydro code simulations of the implosion process are being developed.

19543 (DOE/DP/40030—2, pp 3.1-3.29) **Laser fusion theory.** 1979. NTIS, PC A09/MF A01.

In Inertial fusion research. Annual technical report, 1979.

The following topics are discussed: (1) stimulated scattering, (2) transport in steepened profiles, (3) hot electron production with multiple frequency illumination, (4) rarefaction shock in spherical geometry, and (5) simulation code development. (MOW)

19544 **(DOE/ER—0046/4(Vol.1)) Damage analysis and fundamental studies. Quarterly progress report, October-December 1980.** (Department of Energy, Washington, DC (USA). Office of Fusion Energy). Feb 1981. 202p. NTIS, PC A10/MF A01.

This report is the twelfth in a series of Quarterly Technical Progress Reports on Damage Analysis and Fundamental Studies (DAFS) which is one element of the Fusion Reactor Materials Program, conducted in support of the Magnetic Fusion Energy Program of the US Department of Energy. The first eight reports in this series were numbered DOE/ET-0065/1 through 8.

19545 **(GA-A—15902) Team One (GA/MCA) effort of the DOE 12-tesla coil-development program. Quarterly progress report, April 1- June 30, 1980.** Alcorn, J.S.; Purcell, J.R.; Chen, W.Y.; Hsu, Y.H. (General Atomic Co., San Diego, CA (USA)). Jul 1980. Contract AT03-76ET51011. 4p. NTIS, PC A02/MF A01.

This report covers progress by Team One of the DOE/OFE/D and T 12 Tesla Coil Development Program during the third quarter fiscal period of 1980. The basic mission of this effort is to demonstrate the feasibility of, and to establish an engineering data base for employment of bath cooled NbTi alloy to generate a peak field of 12 tesla in a tokamak reactor. General Atomic Company is the leader of Team One, with the Magnetic Corporation of America as industrial subcontractor. Phase I, development of a NbTi alloy, compositionally and process optimized for 12 tesla operation at temperatures below 4 K, was completed during FY 1979. Phase II, conceptual design of an ETF reactor compatible TF-coil system, employing the NbTi alloy selected by Phase I and an appropriate bath cooling regime, was completed during this reporting period. Progress was also made during this period on Phase III of this effort: Design construction and testing of a solenoid coil utilizing the selected reactor prototypical conductor and bath conditions. During this reporting period, two Phase IV tests were made at the General Atomic High Field Test Facility. Recovery tests were performed upon cabled conductor samples at 3 K and under superfluid (He II) conditions. Results therefrom will be reported in the Fourth Quarter Progress Report of this effort.

19546 **(GA-A—16128) Optical thermography for a fusion tokamak neutral-beam injection system.** McMahon, T.; Kamperschroer, J.; Levine, F.; Colleraine, T. (General Atomic Co., San Diego, CA (USA)). Nov 1980. Contract AT03-76ET51011. 11p. (CONF-801139—3). NTIS, PC A02/MF A01.

From Electro-optics/laser conference; Boston, MA, USA (19 Nov 1980).

A brief description is given of the protective armor plate as it pertains to both pyrometer and infrared camera requirements. The operating principles and test results for a number of these instruments are considered separately in two subsequent sections. We conclude with a discussion of which camera and pyrometer proved to be most suitable for protective surveillance of the armor plate.

19547 **(HEDL-SA—2250) Path E alloys: ferritic material development for magnetic fusion energy applications.** Holmes, J.J. (Hanford Engineering Development Lab., Richland, WA (USA)). Sep 1980. Contract AC14-76FF02170. 25p. (CONF-8010140—2). NTIS, PC A02/MF A01.

From MOE/DOE seminar; Mito, Japan (27 Oct 1980).

The application of ferritic materials in irradiation environments has received greatly expanded attention in the last few years, both internationally and in the United States. Ferritic materials are found to be resistant to irradiation damage and have in many cases superior properties to those of AISI 316. It has been shown that for magnetic fusion energy applications the low thermal expansion behavior of the ferritic alloy class will result in lower thermal stresses during reactor operation, leading to significantly longer ETF operating lifetimes. The Magnetic Fusion Energy Program therefore now includes a ferritic alloy option for alloy selection and this option has been designated Path E.

19548 (HEDL-SA—2360) Summary of HEDL Fusion Reactor Safety Support studies. Muhlestein, L.D.; Jeppson, D.W.; Barreca, J.R. (Hanford Engineering Development Lab., Richland, WA (USA)). 1981. Contract AC14-76FF02170. 24p. (CONF-810352—1). NTIS, PC A02/MF A01.

From International Atomic Energy Agency conference; Vienna, Austria (23 Mar 1981).

The HEDL Fusion Reactor Safety Support studies are focused on characterizing blanket-coolant-material reactions for deuterium-tritium fusion reactor designs. The objective is to determine and examine potential safety and environmental issues associated with proposed blanket/coolant combinations under postulated accident conditions. The first studies considered liquid lithium as both blanket and coolant, and examined liquid lithium-material reactions. Liquid lithium reactions with oxygen, nitrogen, and various concretes have been characterized. Evaluations of lithium reaction extinguishment methods, lithium aerosol generation and collection, and the volatilization and transport of radioactive materials in connection with lithium-air reactions have been completed. Lithium compound blanket material reactions with water, a prime coolant candidate, have been characterized in terms of energy and gas release rates. Blanket materials considered were lithium aluminate, lithium oxide, lithium zirconate, lithium silicate, and lithium lead alloys ($Li_{17}Pb_2$ and $Li_{17}Pb_{83}$).

19549 (LA—8711-P) Proposal to produce large compact toroids. Phillips, J.A. (Los Alamos Scientific Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 33p. NTIS, PC A03/MF A01.

Relatively large, hot compact toroids might be produced in the annular space between two concentric one-turn coils. With currents in the two coils flowing in the same direction, the magnetic fields on each side of the plasma are in opposite directions. As the fields are raised, the plasma ring is heated and compressed radially towards the center of the annular space. By the addition of two sets of auxiliary coils, the plasma ring can be ejected out one end of the two-coil system into a long axial magnetic field.

19550 (LA—8740-PR) Tokamak poloidal field systems. Progress report, January 1-December 31, 1980. Rogers, J.D. (comp.). (Los Alamos Scientific Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 34p. NTIS, PC A03/MF A01.

Work is reported on the development of superconducting tokamak poloidal field system (TPFS) program. Progress is discussed on the design of the 20 MJ, 50 kA, 7.5 T superconducting pulsed energy storage coil to be operated in a bipolar mode from +7.5 T to -7.5 T in an energy transfer period of 1.5 to 5 s in 1982 followed by extensive cyclic testing. The facility to conduct the tests uses a traction motor energy transfer system and a nonconducting dewar. Status of the hardware development for the TPFS program is presented. Current interrupter development and testing for protection and energy transfer circuits are also presented. The 400 kJ METS coil test results are given.

19551 (LA—8758-MS) Compact-Toroid fusion reactor based on the field-reversed theta pinch. Hagenson, R.L.; Krakowski, R.A. (Los Alamos National Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 127p. NTIS, PC A07/MF A01.

Early scoping studies based on approximate, analytic models have been extended on the basis of a dynamic plasma model and an overall systems approach to examine a Compact Toroid (CTOR) reactor embodiment that uses a Field-Reversed Theta Pinch as a plasma source. The field-reversed plasmoid would be formed and compressionally heated to ignition prior to injection into and translation through a linear burn chamber, thereby removing the high-technology plasmoid source from the hostile reactor environment. Stabilization of the field-reversed plasmoid would be provided by a passive conducting shell located outside the high-temperature blanket but within the low-field superconducting magnets and associated radiation shielding. On the basis of this batch-burn but thermally steady-state approach, a reactor concept emerges with a length below ~ 40 m that generates 300 to 400 MWe of net electrical power with a recirculating power fraction less than 0.15.

19552 (LA-UR—81-433) Suppression of ignition by interface instabilities in small fusion targets. Kirkpatrick, R.C. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 17p. (CONF-810620—1). NTIS, PC A02/MF A01.

From 4. international topical conference on high-power electron and ion-beam research and technology; Palaiseau, France (29 Jun 1981).

Concern over hydrodynamic instabilities in small fusion targets has prompted numerous studies of instability onset, but few studies of the consequences. Here for the first time a mechanism is identified which tends to suppress ignition in small fusion targets. The mechanism is that of radiative energy loss into the increased area of a perturbed surface. Quantitative assessment of this mechanism is provided by modeling it in a 12 parameter burn code. It is contrasted with two other mechanisms and shown to be a significantly more serious consideration for DT ignition in the Wheeler mode.

19553 (LBL—11745) Focusing of heavy-ion beams on a fusion target. Garren, A.; Krafft, G.; Haber, I. (Lawrence Berkeley Lab., CA (USA); Naval Research Lab., Washington, DC (USA)). Mar 1981. Contract W-7405-ENG-48. 5p. (CONF-810314—120). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

A beam line has been designed for transport between a periodic channel and a fusion target in a way intended to minimize effects of non-uniform transverse and longitudinal densities and of momentum spread. Principles used for the design are explained. The beam line is described and its performance as shown by envelope integration and particle simulation is presented.

19554 (NRL-MR—4498) Fully two-dimensional equilibrium and transport model of the poloidal divertor. Emery, M.H.; Winsor, N.K. (Naval Research Lab., Washington, DC (USA)). 20 Apr 1981. Contract AI01-77DP40042. 85p. NTIS, PC A05/MF A01.

We have developed a fully two-dimensional Eulerian-Lagrangian nonideal MHD simulation model of tokamak discharges. The code is designed to simultaneously follow the resistive diffusion transport and gross dynamics of a magnetically confined plasma of arbitrary shape. It uses as a finite-difference mesh a general connectivity triangular grid. The triangular grid is the natural choice for a finite-difference mesh for modeling complicated geometries with interfaces, multiple magnetic axes and separatrices. We present here the methods we have developed to calculate equilibria and transport in a fully two-dimensional geometry. The model is sufficiently general that it is capable of calculating equilibria and transport given rather general plasma geometries and coil structures. Here we apply the model to the poloidal divertor system and describe the results.

19555 (NRL-MR—4500) Simulation of laser beam nonuniformity effects. Emery, M.H.; Gardner, J.H.; Boris, J.P.; Orens, J.H. (Naval Research Lab., Washington, DC (USA)). 24 Apr 1981. Contract AI01-77DP40042. 23p. NTIS, PC A02/MF A01.

We investigate the effect of a nonuniform beam on the ablative acceleration of thin foils using the FAST2D laser-shell simulation code. The results show that laser nonuniformities with scalelengths greater than the distance from the ablation surface to the critical surface would have a severe impact on drive pressure symmetry and hence on pellet gain.

19556 (NRL-MR—4503) Calculations of Brillouin backscatter in laser-produced plasmas. Manheimer, W.M.; Colombant, D.G. (Naval Research Lab., Washington, DC (USA)). 24 Apr 1981. Contract AI01-77DP40042. 34p. NTIS, PC A03/MF A01.

Brillouin backscatter is calculated in an inhomogeneous laser produced plasma. Equations for the spatial dependence of the incident reflected and sound wave are numerically integrated through the underdense plasma. Effects investigated are the stabilizing effects of ion heating or nonlinear sound wave dissipation, flow velocity magnitude and gradient, electron heating and broad band in-

cident laser light. We find that the effect of velocity gradient and broad band light can be very important in reducing the backscatter.

19557 **Annual ASME symposium, 20th, fusion energy production: the potential and the problems, 1980.** Albuquerque, NM; American Society of Mechanical Engineers (1980). 95p. (CONF-800325—).

From ASME symposium on fusion energy products; Albuquerque, NM, USA (20 Mar 1980).

Collection of 11 papers by various authors. Two of the papers appear as abstracts only. Some of the topics discussed are: Laser fusion at LASL; Magnetic fusion at LASL; Utility view of fusion; Particle beam fusion; Tokamak fusion; Magnetic mirror fusion. Individual papers are separately indexed.

19558 **(ORNL/TM—7783) Iso-response contours in the ETF neutral-beam injectors.** Barnes, J.M.; Santoro, R.T.; Lillie, R.A.; Alsmiller, R.G. Jr. (Oak Ridge National Lab., TN (USA)). May 1981. Contract W-7405-ENG-26. 21p. NTIS, PC A02/MF A01.

Iso-response contours in the Engineering Test Facility (ETF) neutral beam injector have been calculated for the neutron flux, nuclear heating in SS-316 and G10 insulation, biological dose rate, and the $^{58}Ni(n,p)^{58}Co$ and $^{59}Co(n,\gamma)^{60}Co$ reactions. The spatial dependence of these responses in the injector, in the shielding that surrounds it, and in the injection duct is presented.

19559 **(PPPL—1753) New techniques for calculating heat and particle source rates due to neutral-beam injection in axisymmetric tokamaks.** Goldston, R.J.; McCune, D.C.; Towner, H.H.; Davis, S.L.; Hawryluk, R.J.; Schmidt, G.L. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Feb 1981. Contract AM02-76CH03073. 34p. NTIS, PC A03/MF A01.

A set of numerical techniques are described for calculating heat and particle source rates due to neutral beam injection in axisymmetric tokamaks. While these techniques consume a substantial amount of computer time, they take into account a number of significant, and normally neglected, effects. Examples of these effects are reionization of escaping charge exchanged beam particles, finite fast ion orbit excursions, beam deposition through collisions of beam neutrals with circulating beam ions, and the transport of thermal neutrals in the plasma due to charge changing collisions with beam ions.

19560 **(PPPL—1759) Plasma heating with multi-MeV neutral impurity beams.** Grisham, L.R.; Post, D.E.; Eubank, H.P.; Firestone, M.; Mikkelsen, D.R.; Singer, C.E.; Weisheit, J. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Mar 1981. Contract AM02-76CH03073. 15p. NTIS, PC A02/MF A01.

The utility of neutral beams of $A \geq 6$ AMU formed from negative ions, accelerated to $\sim$ 1 MeV/AMU and neutralized, is explored for heating toroidally confined plasmas. Such beams offer the promise of significant advantages relative to conventional neutral beams based upon positive or negative hydrogen ions at 100 to 200 keV/AMU.

19561 **(SAND—80-0974) Particle-beam-fusion progress report, July 1979 through December 1979.** (Sandia National Labs., Albuquerque, NM (USA)). Jan 1981. Contract AC04-76DP00789. 155p. NTIS, PC A08/MF A01.

The following chapters are included in this semi-annual progress report: (1) fusion target studies, (2) target experiments, (3) particle-beam source developments, (4) particle beam experiments, (5) pulsed power, (6) pulsed power applications, and (7) electron beam fusion accelerator project. (MOW)

19562 **(UCID—18827) Computational compact torus experiment.** Eddleman, J.L.; McNamara, B.; Nash, J.K.; Shearer, J.W.; Turner, W.C. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 24 Dec 1980. Contract W-7405-ENG-48. 39p. NTIS, PC A03/MF A01.

We describe a typical 2D magnetohydrodynamic (MHD) calculation of rundown of plasma in a coaxial, magnetized gun and injection of the plasma and reconnection of the embedded magnetic fields to form a compact toroidal plasma.

19563 **(UCRL—15328) Free-free gaunt factors for gold plasmas at laser-fusion conditions.** Green, J. (R and D Associates, Marina del Rey, CA (USA)). Feb 1981. Contract W-7405-ENG-48. 28p. (RDA-TR—108600-003-R.1). NTIS, PC A03/MF A01.

Detailed calculations were made of the free-free absorption process for electrons traveling in the region of the temperature-dependent Thomas-Fermi potential of various gold plasmas. The Born approximations folded into this potential give a poor representation of the cross section.

19564 **(UCRL—53060) Preliminary design of a Tandem-Mirror-Next-Step facility.** Damm, C.C.; Doggett, J.N.; Bulmer, R.H. (Lawrence Livermore National Lab., CA (USA)). 18 Dec 1980. Contract W-7405-ENG-48. 120p. NTIS, PC A06/MF A01.

The Tandem-Mirror-Next-Step (TMNS) facility is designed to demonstrate the engineering feasibility of a tandem-mirror reactor. The facility is based on a deuterium-tritium (D-T) burning, tandem-mirror device with a fusion power output of 245 MW. The fusion power density in the central cell is 2.1 MW/m^3, with a resultant neutron wall loading of 0.5 MW/m^2. Overall machine length is 116 m, and the effective central-cell length is 50.9 m. The magnet system includes end cells with yin-yang magnets to provide magnetohydrodynamic (MHD) stability and thermal-barrier cells to help achieve a plasma Q of 4.7 (where Q = fusion power/injected power). Neutral beams at energies up to 200 keV are used for plasma heating, fueling, and barrier pumping. Electron cyclotron resonant heating at 50 and 100 GHz is used to control the electron temperature in the barriers. Based on the resulting engineering design, the overall cost of the facility is estimated to be just under $1 billion. Unresolved physics issues include central-cell β-limits against MHD ballooning modes (the assumed reference value of β exceeds the current theory-derived limit), and the removal of thermalized α-particles from the plasma.

19565 **(UCRL—53120(Summ.)) Summary of TMX results: executive summary.** Simonen, T.C. (ed.). (Lawrence Livermore National Lab., CA (USA)). 26 Feb 1981. Contract W-7405-ENG-48. 10p. NTIS, PC A02/MF A01.

This report summarizes results from the successful experimental operation of the Tandem Mirror Experiment (TMX) over the period October 1978 through September 1980. The experimental program, summarized by the DOE milestones given in Table 1, had three basic phases: (1) an 8-month checkout period, October 1978 through May 1979; (2) a 6-month initial period of operation, June through November 1979, during which the basic principles of the tandem configuration were demonstrated (i.e., plasma confinement was improved over that of a single-cell mirror); and (3) a 10-month period, December 1979 through September 1980, during which the initial TMX results were corroborated by additional diagnostic measurements and many detailed physics investigations were carried out. This report summarizes the early results, presents results of recent data analysis, and outlines areas of ongoing research.

19566 **(UCRL—84229) Reactor systems modeling for ICF hybrids.** Berwald, D.H.; Meier, W.R. (TRW, Inc., Redondo Beach, CA (USA); Lawrence Livermore National Lab., CA (USA)). Oct 1980. Contract W-7405-ENG-48. 31p. (CONF-801011—84). NTIS, PC A03/MF A01.

From 4. ANS topical meeting on the technology of controlled nuclear fusion; King of Prussia, PA, USA (14 Oct 1980).

The computational models of ICF reactor subsystems developed by LLNL and TRW are described and a computer program was incorporated for use in the EPRI-sponsored Feasibility Assessment of Fusion-Fission Hybrids. Representative parametric variations have been examined. Many of the ICF subsystem models are very preliminary and more quantitative models need to be developed and included in the code.

19567 (UCRL—84826(Rev.1)) Hybrid reactors. Moir, R.W. (Lawrence Livermore National Lab., CA (USA)). 19 Mar 1981. Contract W-7405-ENG-48. 27p. (CONF-810326—2(Rev.1)). NTIS, PC A03/MF A01.

From Jahrestagung Kerntechnik; Dusseldorf, F.R. Germany (24 Mar 1981).

The rationale for hybrid fusion-fission reactors is the production of fissile fuel for fission reactors. A new class of reactor, the fission-suppressed hybrid promises unusually good safety features as well as the ability to support 25 light-water reactors (LWRs) of the same nuclear power rating, or even more high-conversion-ratio reactors such as the heavy-water type. One 4000-MW nuclear hybrid can produce 7200 kg of ^{233}U per year. To obtain good economics, injector efficiency times plasma gain (eta/sub i/Q) should be greater than 2, the wall load should be greater than 1 $MW.m^{-2}$, and the hybrid should cost less than 6 times the cost of a light-water reactor. Introduction rates for the fission-suppressed hybrid are unusually rapid.

19568 (UCRL—84922) Electroforming copper targets for RTNS-II. Kelley, W.K.; Dini, J.W.; Logan, C.M. (Lawrence Livermore National Lab., CA (USA)). 6 Feb 1981. Contract W-7405-ENG-48. 18p. (CONF-810619—1). NTIS, PC A02/MF A01.

From American Electroplaters' Society conference; Boston, MA, USA (28 Jun 1981).

Copper targets used in RTNS II, which is the world's most intense 14-MeV neutron source, contain water cooling channels for temperature control. There are two methods for fabricating these targets: (1) diffusion bonding a copper panel containing photoetched channels to another copper panel, and (2) an electroforming technique which involves filling the photoetched channels with wax, plating thick copper to seal over the channels and then removing the wax. Development of this latter process and results obtained with it are described.

19569 (UCRL—85162) New concept for a high-repetition-rate reactor for inertial-confinement fusion. Monsler, M.J. (Lawrence Livermore National Lab., CA (USA)). Nov 1980. Contract W-7405-ENG-48. 30p. (CONF-801011—83). NTIS, PC A03/MF A01.

From 4. ANS topical meeting on the technology of controlled nuclear fusion; King of Prussia, PA, USA (14 Oct 1980).

A new design concept was developed that has three additional features that are very important in reducing program risk: (1) through a proper choice of the working temperature (400 to 540°C) and of the liquid metal (lithium or lead-lithium eutectic alloy), we can select a chamber pressure within the range of 10^{-1} to 10^{-4} Torr, required for the propagation of either a laser-beam or a heavy-ion-beam driver; (2) presently available ferritic steels can be used for the structural material; and (3) the new concept allows flexibility in irradiaton geometry. Although two-sided irradiation at high f/Nos. seems most attractive from the standpoints of minimizing the number of chamber penetrations and of simplifing the layout of the balance of plant, we must provide for the possibility that target-implosion physics will require a more symmetrical illumination geometry.

19570 (UCRL—85589) Formation of negative hydrogen ions in surface and volume processes. Hiskes, J.R. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). 20 Mar 1981. Contract W-7405-ENG-48. 13p. (CONF-810442—1). NTIS, PC A02/MF A01.

From Joint workshop on negative ions; Mexico City, Mexico (1 Apr 1981).

The backscattering of energetic hydrogen particles, 1-1000 eV, from alkali metal surfaces provides for a relatively large yield of negative hydrogen ions. These yields are enhanced by particle reflection from surfaces consisting of partial alkali coatings over high-Z transition-metal substrates. The theoretical data supporting these observations are reviewed. The parameters leading to optimum reflection yields are summarized. In the volume of a hydrogen discharge with electron temperatures of about one electron volt, negative ions are formed by dissociative attachment to vibrationally excited molecules. The vibrational distribution is determined by e-V collisions between low energy electrons and vibrationally excited molecules, E-V singlet electron excitation processes caused by high energy (100 eV) electrons colliding with ground state molecules exciting to electronic states followed by radiative decay to higher vibrational levels, and V-T collisions between molecules resulting in transfer of vibrational excitation to translational energy. The role of these different processes as they bear on the vibrational distribution is discussed. The possibility of a volume-surface interaction leading to a high volume density of negative ions is considered.

19571 (UCRL—85691) Fusion-reactor aspects of the compact torus. Hartman, C.W. (Lawrence Livermore National Lab., CA (USA)). 11 Mar 1981. Contract W-7405-ENG-48. 22p. NTIS, PC A02/MF A01.

This paper summarizes several studies of fusion reactors based on the compact torus (CT). A wide variety of reactor configurations can be projected within present understanding of the possible types of CT and their macroscopic stability and confinement properties. Three types of CT are considered here, the field-reversed-configuration having B/sub Toroidal/ = 0, the Spheromak with B/sub T/ not equal to 0, and CT's formed with particle rings. For each type, either fixed or moving-ring possibilities are offered along with pulsed or steady operation. In all cases the CT configuration lends itself to simplified blanket and coil design. In certain, important cases a reactor-scale CT is predicted to produce small unit power (10-100 MW/sub e/) facilitating small-scale pilot plants and eventual modularity.

19572 Non-asymptotic theory of collisionless reconnecting modes. Antonsen, T.M. Jr.; Coppi, B. (Massachusetts Inst. of Tech., Cambridge (USA)). *Physics Letters, [Section] A ;* **81**: No. 6, 335-338(2 Feb 1981).

The problem of collisionless modes that produce magnetic reconnection is solved in the physically meaningful limit where the mode amplitude is the solution of an integral equation which retains gyro radius effects to all orders. When the electron temperature gradient is comparable to the density gradient a new strong stabilizing effect is found.

19573 Hot-electron preheat of laser-driven targets. Kidder, R.E. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). *Nuclear Fusion ;* **21**: No. 2, 145-151(Feb 1981).

In laser fusion, excessive preheat of the DT fuel by hot electrons reduces the achievable thermonuclear energy gain from the imploded target. A criterion defining the tolerable amount of preheat is derived which implies that the work needed to compress the fuel must not exceed the least possible (minimum entropy) value by more than a factor of about three. - The amount of high-Z shielding that is required to limit fuel preheat to this permissible level is calculated, and the laser-pulse energy Wsub(L) that is needed to implode an adequately shielded target is then determined. An explicit relation is obtained that describes the dependence of Wsub(L) on the various physical parameters of the system. - It is concluded that hot-electron preheat may preclude adequate energy gain with targets driven by 1.06-μm light unless pulse energies in excess of one megajoule are available. It appears, however, that frequency doubling or tripling of 1.06-μm light can reduce hot-electron preheat to a relatively insignificant level, and is an option that is currently receiving serious consideration.

19574 Mechanisms responsible for topographical changes in PLT stainless-steel and graphite limiters. Cohen, S.A.; Budny, R.; McCracken, G.M.; Ulrickson, M. (Princeton Univ., NJ (USA). Plasma Physics Lab.). *Nuclear Fusion ;* **21**: No. 2, 233-249(Feb 1981).

PLT limiters used during Ohmic and neutral-beam heated discharges were melted and eroded. For the steel limiters, the pattern of large (20 cm^2) melted areas was 0.1-1.0-mm ripples in a regular array. The various types of damage can be explained by the power and momentum fluxes of bulk plasma and beam ions and by disruptions. The plasma scrape-off distance inferred from the extent of the damage ranges from 5 to 30 mm and is consistent with a radially outward drift velocity of $2x10^4$ $mm.s^{-1}$. A new model of the plasma scrape-off is presented which explains pattern and extent of the damage.

19575 Post-disruptive shift of magnetic axis in non-circular tokamaks. Okabayashi, M.; Maeda, H.; Takahashi, H.; Reusch, M. (Princeton Univ., NJ (USA). Plasma Physics Lab.). *Nuclear Fusion ;* **21**: No. 2, 271-275(Feb 1981).

The magnitude of magnetic-axis shift, following a sudden, disruptive decrease in internal inductance and poloidal β, can be greatly reduced in non-circular tokamaks by exploiting the negative decay index of the equilibrium magnetic field. In this sense, a non-circular plasma has important advantages over a circular plasma in preventing the catastrophic consequences of major disruptions. A tokamak design and operational concept is discussed, which exploits these advantages and is fundamentally different from the traditional approach.

19576 Dependence of target yield on input energy profile. Jorna, S.; Metzler, N.; Hammerling, P. (Occidental Research Corp., La Jolla, CA (USA)). *Physics Letters, [Section] A ;* **80**: No. 5/6, 380-382(22 Dec 1980).

Inertial confinement fusion using light ion beams that require longitudinal bunching imply ions whose energy increases with time. Such profiling of the incident ion beam energy could be expected to result in improved yields and better hydrodynamic coupling. These expectations have been confirmed by numerical simulations.

19577 Method and apparatus for the formation of a spheromak plasma. Yamada, M.; Furth, H.P.; Stix, T.H.; Todd, A.M. (to Dept. of Energy). US Patent Application 173,555. 30 Jul 1980. 49p.

A method and apparatus are described for forming a detached, compact toroidally shaped spheromak plasma by an inductive mechanism. A generally spheroidal vacuum vessel houses a toroidally shaped flux ring or core which contains poloidal and toroidal field generating coils. A plasma discharge occurs with the pulsing of the toroidal field coil, and the plasma is caused to expand away from the core and toward the center of the vacuum vessel. When the plasma is in an expanded state, a portion of it is pinched off in order to form a separate, detached spheromak plasma configuration. The detached plasma is supported by a magnetic field generated by externally arranged equilibrium field coils.

19578 Thermomagnetic burn control for magnetic fusion reactor. Rawls, J.M.; Peuron, A.U. (to Dept. of Energy). US Patent Application 164,989. 1 Jul 1980. 14p.

Apparatus is provided for controlling the plasma energy production rate of a magnetic-confinement fusion reactor, by controlling the magnetic field ripple. The apparatus includes a group of shield sectors formed of ferromagnetic material which has a temperature-dependent saturation magnetization, with each shield lying between the plasma and a toroidal field coil. A mechanism for controlling the temperature of the magnetic shields, as by controlling the flow of cooling water therethrough, thereby controls the saturation magnetization of the shields and therefore the amount of ripple in the magnetic field that confines the plasma, to thereby control the amount of heat loss from the plasma. This heat loss in turn determines the plasma state and thus the rate of energy production.

19579 Laser fusion at the Lawrence Livermore Laboratory. Glass, A.J. (Lawrence Livermore Lab, Calif). pp 5-10 of Annual ASME symposium, 20th, fusion energy production: the potential and the problems, 1980. Albuquerque, NM; American Society of Mechanical Engineers (1980).

From ASME symposium on fusion energy products; Albuquerque, NM, USA (20 Mar 1980).

The Laser Fusion Program at the Lawrence Livermore Laboratory is described. The basic requirements of inertial confinement fusion (ICF) are developed, and their consequences for driver performance are described. Current and planned experimental facilities at I LL, including the Argus, Shiva, and Nova laser systems, are described. New laser development and reactor design studies are also discussed. 10 refs.

19580 Laser fusion at LASL. Stratton, T.F. (Los Alamos Sci Lab, NM). pp 11-18 of Annual ASME symposium, 20th, fusion energy production: the potential and the problems, 1980. Albuquerque, NM; American Society of Mechanical Engineers (1980).

From ASME symposium on fusion energy products; Albuquerque, NM, USA (20 Mar 1980).

Research on Inertial Confinement Fusion at LASL is described. Work is devoted to a balanced effort in laser development, target experiments and target fabrication, plasma theory and target design, and diagnostic development. The activity has grown to encompass the work of about 330 persons at an annual budget of ;27 M in fiscal year 1980 for experiments, target fabrication, theory, and laser development. In addition, construction work on a large carbon-dioxide laser driver, Antares, is funded at ;12 M in FY-80. 8 refs.

19581 Magnetic fusion at LASL. Quinn, W.E. (Los Alamos Sci Lab, NM). pp 19-26 of Annual ASME symposium, 20th, fusion energy production: the potential and the problems, 1980. Albuquerque, NM; American Society of Mechanical Engineers (1980).

From ASME symposium on fusion energy products; Albuquerque, NM, USA (20 Mar 1980).

The Magnetic Fusion Energy program at Los Alamos is divided among three categories: Applied Plasma Physics, which includes Advanced Fusion Concepts, Plasma Theory and Computer Applications, and Experimental Plasma Research; Development and Technology; and Confinement Systems. The aims and objectives of the three programs are discussed. 6 refs.

19582 Technological aspects of particle beam fusion. Cook, D.L. (Sandia Lab, Albuquerque, NM). pp 37-46 of Annual ASME symposium, 20th, fusion energy production: the potential and the problems, 1980. Albuquerque, NM; American Society of Mechanical Engineers (1980).

From ASME symposium on fusion energy products; Albuquerque, NM, USA (20 Mar 1980).

Reactor design considerations which are unique to the utilization of light ion beams are presented. Some of the basic technological and economic issues associated with reactor size are addressed. Advanced experimental facilities needed for the development of this technology as a power source are described, and an example of one of them is given. A few brief comments on the power supply technology which might be employable in these facilities conclude this overview. 21 refs.

19583 Tokamak fusion. Meade, D. (Princeton Univ, NJ). pp 47-53 of Annual ASME symposium, 20th, fusion energy production: the potential and the problems, 1980. Albuquerque, NM; American Society of Mechanical Engineers (1980).

From ASME symposium on fusion energy products; Albuquerque, NM, USA (20 Mar 1980).

The basic plasma physics reqirements for a fusion reactor are to produce: (1) plasma confinement with the product of fuel density, n, and energy confinement time, /tau/, exceeding 2*10/sup 14/ cm/sup -3/ sec, (2) high ion temperatures in the range of 10 to 20 keV, and (3) impurity control sufficient to keep impurity concentrations in the range of 0.1 to 1% of the fuel density. This article reviews the status of tokamak devices as possible fusion reactors.

19584 Perspectives and some recent developments concerning declassification of the inertial confinement fusion (ICF) program. Harrach, R.J. (Lawrence Livermore Lab, CA). *Energy Communications ;* **6**: No. 3, 223-230(1980).

Of the United States' two major research and development programs pursuing the goal of fusion energy production, the magnetic confinement fusion energy (MFE) program was removed from security classification restrictions in 1958, whereas the inertial confinement fusion (ICF) program remains classified in part, with concomitant barriers to information flow and scientific cooperation both internationally and intranationally. This report attempts to put the question of ICF classification in perspective, and to review and remark upon very recent developments that bear on this issue. Attention is drawn especially to an appeal by Ray Kidder for ICF declassification. 16 refs.

19585 **Fusion-fission systems analysis and the impact of nuclear data uncertainties on design.** Youssef, M.Z.H.M. Madison, WI; Univ. of Wisconsin (1980). 338p. University Microfilms Order No. 80-25,860.

Thesis (Ph. D.).

The research in this thesis aimed at arriving at an optimal blanket design for the fusion-fission hybrid reactor, SOLASE-H. In this design, light water reactor-type ThO_2 fuel assemblies are extracted from the blanket after reaching ~ 4% enrichment in U-233 and placed directly in fission reactors without reprocessing. Sodium is used as a coolant and lead as a neutron multiplier through the (n,2n') reactions. The neutron spectrum has been tailored to minimize nonuniformity in the spacial distribution of the bred U-233. Starting with 196,350 kg of Th, the amount left after 2.7 years is 187,500 kg. The U-233 produced is 7560 kg with ~ 13% burnup. The blanket energy multiplication varies from ~ 1.59 at the beginning of life to ~ 4.96 at 4% enrichment time.

99 GENERAL AND MISCELLANEOUS

9901 Management

19586 **(CONF-810449—1) Return on your metrication investment: a case study.** Cuddy, L.M. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 29p. NTIS, PC A03/MF A01.

From 7. ANMC annual conference on productivity opportunities of metrication; Washington, DC, USA (13 Apr 1981).

Union Carbide Corporation Nuclear Division (UCCND) has been using a dual system of units since its very inception 35 years ago. This metrication process edicts that we evaluate each conversion opportunity on its own merits. UCCND has initiated a productivity program, but unfortunately to date it has not focused on metrication opportunities. Metrication investments should be evaluated using an economic model. Most productivity functions are concerned about inputs and outputs; those valuable resources that make up the inputs must be quantified and assessed against the possible returns. All metrication investments will result in negative and positive cash flows. Timely and well planned conversions are required to assure financial success. It goes without saying, choose only those opportunities, those metrication opportunities, that exceed your company's hurdle rate for similar risk category investments. The Nuclear Division experience has shown that untimely conversions can be very poor investments. Conversely, well planned and analyzed metrication opportunities can prove to be financially advantageous. The conversion pace under the present law will be slow, and will probably remain so until there is enough foreign trade pressure on our economy to force conversion in a rapid manner.

19587 **(ORAU—176A) Training and technology statistical report, October 1979-September 1980.** (Oak Ridge Associated Universities, Inc., TN (USA)). Jan 1981. Contract AC05-76OR00033. 18p. NTIS, PC A02/MF A01.

A total of 839 trainees were enrolled at TAT during the 1979 to 1980 training year. Section One of this statistical report includes information on only those 613 trainees who exited training between October 1, 1979, and September 30, 1980. Demographic, educational, and employment data on the 613 exiting trainees - graduates and nongraduates - are summarized. There were 478 graduates (78% of concluding trainees), of whom 459 were available for placement. Profile summaries of graduates and nongraduates are tabulated. Of the 459 available for placement, 432 were placed in jobs with beginning wages averaging $6.34 per hour. The estimated annual income for those who were placed, assuming 2080 h/y, was $13,187. The majority of graduates, 85.8%, were unemployed at the time they entered TAT. The remainder, 14.2% of graduates, reported wages averaging $3.62 per hour at entry to training. Projected on an annual basis, those graduates employed at entry earned $7529. Compared to the average starting wage of placed TAT trainees on their first jobs after graduation, $13,187, their increased earnings were $5658 or a 75% increase after training. During the training year there were 135 trainees who did not graduate. Exit information on these nongraduates is presented. In addition to industrial skills training, TAT offers trainees who do not have a high school diploma or its equivalent the opportunity to work on the General Education Development (GED) by studying at TAT. Thirty-five trainees received their GED certification during the 1979 to 1980 training year. Supplementary statistical data on TAT enrollments, training and placement from 1966 to 1980 is provided.

9902 Mathematics And Computers

REFER ALSO TO CITATION(S) 18918, 19162, 19460, 19461, 19621

19588 **(CONF-810440—1) Computer graphics at Oak Ridge National Laboratory: some observations based on experience.** Johnson, P.E. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 19p. NTIS, PC A02/MF A01.

From Princeton conference on computer graphics applications; Princeton, NJ, USA (2 Apr 1981).

This paper focuses upon explaining six conclusions concerning what the author considers to be an appropriate philosophy toward developing computer graphics software, particularly computer mapping. In summary, the conclusions are that computer mapping software should not be developed apart from the researcher or analyst and that those efforts developed apart tend to be esoteric in nature. Three examples involving regional energy modeling and related impact assessment are used to illustrate how development of computer graphics should be integrated into research involving geographical analysis.

19589 **(DOE/ER/10516—6) Data management design: nucleon-nucleon data bank (0 to 1200 MeV).** Signell, P.; Freiheit, F. (Michigan State Univ., East Lansing (USA). Dept. of Physics). 10 Apr 1981. Contract AC02-79ER10516. 23p. NTIS, PC A02/MF A01.

This is a guide to the design of the on-line data records in this bank, covering all energies and particle combinations up to about 1200 MeV. The design of the bank's management system satisfies almost all of the conditions set forth in the proposed Design Principles for Physics Data Banks. (GHT)

19590 (DOE/EV/04326—3, pp X.1-X.3) **Modification of existing computing capabilities.** 1980. NTIS, PC A08/MF A01.

In In vivo measurements of bone-seeking radionuclides. Progress report, 1977-1980.

To upgrade the existing computing facilities for whole body counting data analysis, a system renovation has been undertaken which: (1) expands the existing storage and computational memory, (2) provides a multi-language computer-based system, and (3) increases data input/output speed. (KRM)

19591 **(EGG-IS—5376) Fault-tree construction on the INEL CAD system.** England, J.; Rasmuson, D.M. (EG and G Idaho, Inc., Idaho Falls (USA)). Apr 1981. Contract AC07-76ID01570. 39p. NTIS, PC A03/MF A01.

This manual describes the procedures necessary in creating and maintaining fault tree files using the INEL CAD (Computer Aided Design) System and the subsequent transfer of the graphic file to a CYBER readable format for reliability analysis by computer. The information contained in this guide assumes that the user is familiar with the basics of fault tree analysis and the CAD system hardware.

19592 **(LA—8725-MS) Computing Division two-year operational plan, FY 1981-1982.** Euald, R.H.; Worlton, W.J.; McCormick, M. (Los Alamos Scientific Lab., NM (USA)). Feb 1981. Contract W-7405-ENG-36. 109p. NTIS, PC A06/MF A01.

This report is a comprehensive planning guide for the Computing Division of the Los Alamos National Laboratory for fiscal years 1981 and 1982. Subjects discussed include critical issues, programmatic requiements, hardware plans, software projects, direct user services, research projects, and projections of future developments.

19593 (LA-UR—80-2422) Validation experiences with a nonlinear shell-of-revolution in ADINA and NONSAP. Cook, W.A. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 27p. (CONF-810601—1). NTIS, PC A03/MF A01.

From ADINA conference; Cambridge, MA, USA (10 Jun 1981).

Validation problems for a nonlinear shell-of-revolution finite element model are described and tabulated. These problems prove this model to be a versatile and accurate model for solving problems, including nonlinear strains and materials, and large rotations. Also, the Broyden-Fletcher-Goldfarb-Shanno (BFGS) solution method in ADINA improves the convergence of this model in the more difficult problems.

19594 (LBL—12235) Power basic and the 9980/9981. Meng, J. (Lawrence Berkeley Lab., CA (USA)). Mar 1981. Contract W-7405-ENG-48. 10p. (CONF-810358—1). NTIS, PC A02/MF A01.

From Texas Instruments-members information exchange symposium; New Orleans, LA, USA (8 Mar 1981).

Microprocessors are today properly classified as logic workhorse devices, falling into sequence with gates and flip-flops just a few years ago and with the diode, transistor and discrete component arrays which served before. To be effectively used as a component the micro must be small, easy to use, flexible and inexpensive. We are building self-contained miniature TI 9980/9981-based modules (2 1/2" x 6" pc board) which are capable of executing power basic and which feature one RS-232 port and 1024 bytes of random access memory (RAM) for program storage. A logical expansion of this module into an array of several such modules on a single larger circuit card is practical. The multiple modules share access to a single Power Basic ROM set and may be made to share areas of RAM as well. Special considerations necessary for the successful use of Power Basic with 9980/9981 central processors are described in detail.

19595 (LBL-PUB—3014) Susie: a program for analysis of 1 dimensional spectra. Version. 20 Feb 1981. Neiman, M. (Lawrence Berkeley Lab., CA (USA)). Feb 1981. Contract W-7405-ENG-48. 39p. NTIS, PC A03/MF A01.

Susie is a program for analysis of 1 dimensional spectra. It uses a disk for spectrum storage, only keeping one spectrum (the current spectrum) in core at a time. This enables Susie to manipulate 20 spectra numbered from 1 to 20. All commands operate upon the current spectrum. There are commands to fit peaks and otherwise manipulate the data in the spectra as well as commands to move spectra both to and from the disk and to and from magnetic tape. Following this introduction there is a list of commands, followed by a more detailed description of each individual command. Finally there is a section with some practical information and an example of a brief session using Susie.

19596 (LBL-PUB—3015) CHART: a graphic display and analysis system. Eades, C.A. (Lawrence Berkeley Lab., CA (USA)). 19 Feb 1981. Contract W-7405-ENG-48. 114p. NTIS, PC A06/MF A01.

This document describes CHART, a program for data analysis and report design.

19597 (LMF—84, pp 233-235) **Real-time program system.** Kelly, C.P.; Stafford, D.L.; Archibeque, F.A.; Kissock, P.S. Dec 1980. NTIS, PC A99/MF A01.

In Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980.

A software package was written to speed development of real-time computer programs. It is a software standard to complement the CAMAC hardware standard for the Inhalation Toxicology Research Institute. The general nature of the package makes it applicable to many different computer projects. The package solves real-time programming problems and frees programmers of many constraints in real-time program development.

19598 (ORAU—178) PREG: a computer program for Poisson regression analysis. Frome, E.L. (Oak Ridge Associated Universities, Inc., TN (USA)). Mar 1981. Contract AC05-76OR00033. 38p. NTIS, PC A03/MF A01.

PREG is a FORTRAN program that computes maximum likelihood estimates for a regression analysis when the dependent variable is a count that follows the Poisson distribution. This documentation contains a detailed description of the algorithm for maximum likelihood estimation under the Poisson regression model (subroutine PRMLE), three test problems with complete output (Appendix A), and a complete listing of the entire FORTRAN program, PREG-Version 5, Release 1 (Appendix B). The three test problems illustrate Poisson regression with (i) a linear regression model, (ii) a log-linear regression model, and (iii) a nonlinear regression model. This program was developed using FORTRAN-10 on a DEC system-10 computer and has been compiled and executed on an IBM 360/91 under OS and an IBM 3033 under VMS without any changes in the source code. ANSI standard FORTRAN was used in all program units except subroutine PRDATA, which can be easily modified to suit individual user requirements.

19599 (ORNL/CSD—80) Some extensions of an algorithm for sparse linear least squares problems. Heath, M.T. (Oak Ridge National Lab., TN (USA)). May 1981. Contract W-7405-ENG-26. 25p. NTIS, PC A02/MF A01.

In this paper several algorithms are developed which extend the method of George and Heath for sparse linear least squares problems to include rank deficient problems, linear equality constrained problems, and updating of solutions. An application of these methods to the solution of sparse square nonsymmetric linear systems is also presented.

19600 (ORNL/TM—7587) Guide to proofing QUME-formatted TEDI files on the ORNL FED versatec printer/plotters. Gray, W.H. (Oak Ridge National Lab., TN (USA)). Mar 1981. Contract W-7405-ENG-26. 38p. NTIS, PC A03/MF A01.

This report presents the modifications to the Oak Ridge National Laboratory (ORNL) version of TEDI to permit the generation o a proof copy of a QUME-formatted file. Under this version of TEDI, a specially formatted file can be created with the new FPR (Format PRoof) command. This proofing file can be postprocessed into a proof copy on any of a variety of graphic devices at ORNL. Specifically, this capability was developed to provide the ORNL Fusion Energy Division (FED) with a fast method of proofing reports by outputting them on the FED DECsystem-10 Versatec printer/plotter instead of on the relatively slow QUME Twin-Track printer. The methods and procedures discussed in this report are not intended to replace the QUME Twin-Track as the final output step in report generation; rather, they are intended to speed up the time-consuming proof-correction-proof cycle.

19601 (ORNL/TM—7666) Software enhancement to produce report-quality graphics from gifts. Gray, W.H.; Baudry, T.V. (Oak Ridge National Lab., TN (USA)). Mar 1981. Contract W-7405-ENG-26. 21p. NTIS, PC A02/MF A01.

The Oak Ridge National Laboratory (ORNL) maintains two versions of the Graphics-Oriented Interactive Finite Element Time-Sharing System (GIFTS) structural analysis computer program modules, one for two DECsystem-10's located at ORNL, the other for a Cray-1 located at Lawrence Livermore Laboratory. These computers are connected via high-bandwidth terrestrial communications equipment. Presented here are the local software enhancements for the ORNL version of GIFTS that permit the creation of inermediate graphics files that may be postprocessed to produce report-quality display images on a variety of graphics devices at ORNL.

19602 (ORNL/TM—7771) DOMINO-II, a general purpose code for coupling DOT-IV discrete ordinates and Monte Carlo radiation transport calculations. Emmett, M.B. (Oak Ridge National Lab., TN (USA)). May 1981. Contract W-7405-ENG-26. 14p. NTIS, PC A02/MF A01.

The DOMINO computer program has been rewritten to allow processing of a DOT-IV multiple boundary source tape. The DOT-IV tape can contain either I-boundary sources, J-boundary sources, or both; but in the latter case DOMINO can process only one of the types in a given run. As with the previous version, there are four types of DOMINO tapes that may be written for use by a Monte Carlo code. A detailed discussion of the differences in this code and the previous one is included.

19603 **(SAND—80-2465) RT-11 interrupt service routines by the rules and otherwise or moral and immoral.** Bourgeois, N.A. Jr. (Sandia National Labs., Albuquerque, NM (USA)). Apr 1981. Contract AC04-76DP00789. 7p. NTIS, PC A02/MF A01.

RT-11's prescribed protocol for interrupt service routines is briefly described. More thoroughly described are several methods of writing interrupt service routines outside of the system rules.

19604 **(SAND—80-2466) RT-11 application.** Bourgeois, N.A. Jr. (Sandia National Labs., Albuquerque, NM (USA)). Apr 1981. Contract AC04-76DP00789. 5p. NTIS, PC A02/MF A01.

An application of the RT-11 single-user operating system is described. The application involves the development of real-time signal processing algorithms for a dedicated microcomputer system. The hardware included in the seven systems of this application is discussed. Reasons for the selection of and continued use of RT-11 are given.

19605 **(SAND—80-2735C) Functional modelling for logic simulation.** Raeth, P.G.; Acken, J.M.; Lamont, G.B.; Borky, J.M. (Air Force Inst. of Tech., Wright-Patterson AFB, OH (USA); Sandia National Labs., Albuquerque, NM (USA)). 25 Nov 1980. Contract AC04-76DP00789. 17p. (CONF-810610—1). NTIS, PC A02/MF A01.

From Design automation conference; Nashville, TN, USA (29 Jun 1981).

As digital integrated circuits become more complex, Computer Aided Design (CAD) must support more hierarchical design methods. Top-down design is supported in logic simulators by the inclusion of functional models. The SAndia LOGic Simulator (SALOGS) has functional modelling capability but until now only as FORTRAN subroutines. The new Structural Interface to the SALOGS Language (SISL) allows the design engineer access to the functional modelling capabilities without requiring the associated programming skills. The SISL syntax is described and a sample functional model library is presented.

19606 **(SAND—81-0202) User instructions for procedure UBARS.** Roginski, R.J. (Sandia National Labs., Albuquerque, NM (USA)). Mar 1981. Contract AC04-76DP00789. 28p. NTIS, PC A03/MF A01.

This document defines the various steps required to execute UBARS, a Network Operating System (NOS) procedure file which generates bar-graph type plot of publishable quality on a high resolution CRT.

19607 **(SAND—81-0468C) Mathematical model of digital systems.** Acken, C. (Sandia National Labs., Albuquerque, NM (USA)). 17 Feb 1981. Contract AC04-76DP00789. 13p. (CONF-810623—1). NTIS, PC A02/MF A01.

From 24. midwest symposium on circuits and systems; Albuquerque, NM, USA (29 Jun 1981).

Mathematical modeling of physical systems has proven to be an extremely valuable, although nontrivial, part of system evaluation. In general, the primary objective of system modeling has been to obtain the simplest mathematical description that adequately predicts the response of the physical system to all anticipated inputs. However, the formulation of a good mathematical model not only requires consideration of the physical factors which describe the system, but also requires consideration of the anticipated use for the mathematical model. The mathematical model outlined in this report represents a digital circuit by a system of discrete-time Boolean equations. The model can be used to describe both combinational and sequential circuits and was formulated for use in the area of test sequence generation and testability analysis. It lends itself to this application since the output of each gate element and each delay element will be completely specified at each time step.

19608 **(SAND—81-0707J) Type-insensitive ODE codes based on implicit A(α): stable formulas.** Shampine, L.F. (Sandia National Labs., Albuquerque, NM (USA)). Mar 1981. Contract AC04-76DP00789. 31p. NTIS, PC A03/MF A01.

This paper is a sequel to the paper which treats A-stable formulas. Although largely independent, it cannot be properly understood without the companion paper. For this reason and to avoid repetition of some lengthy arguments, it is presumed that the reader has studied that paper. Many of the most popular formulas for the solution of stiff ODE problems are not A-stable so that extending the analysis of the first paper is of great practical value. The backward differentiation formulas (BDF) of orders 3 to 6 are examples which are A(α)-stable, and may be thought of as prototypes for the formulas treated here.

19609 **(SAND—81-0797C) Outline for comparison testing of mathematical software: illustrated by comparison testings of software which solves systems of nonlinear equations.** Hiebert, K.L. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 18p. (CONF-810136—1). NTIS, PC A02/MF A01.

From Conference on testing and validating algorithms and software; Boulder, CO, USA (5 Jan 1981).

This paper is the accumulation of experience gained in doing two comparison testings of mathematical software which solve systems of nonlinear equations. One comparison tested software which solves nonlinear least squares problems. The other tested software which solves only square systems of equations, i.e., finds a zero for all the functions. The comparisons are used as examples. The paper presents an outline for comparison testing of mathematical software that is illustrated with examples from the two comparisons. It is hoped that the outline and the examples will make the job of testing mathematical software easier.

19610 **(SAND—81-0815C) Computer graphics in small-scale mechanism design.** Bailey, M.J. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 12p. (CONF-810451—1). NTIS, PC A02/MF A01.

From Engineering Society of Detroit graphics conference; Detroit, MI, USA (28 Apr 1981).

At a time when many small-scale mechanisms are being functionally replaced by logic circuits, some applications, because of strength and durability requirements, continue to require mechanical systems. Because of this, Sandia National Laboratories is moving to upgrade the capabilities and productivity of its mechanism design staff. The key to better design efficiency of these systems is to identify and alleviate real or potential problems prior to construction of any working test model. Productivity is gained when design iterations are performed on a numerical, instead of a phycial, model. The trick is to allow the engineer to interface to the numerical world in a manner that is accurate and natural.

19611 **(UCID—19021) RECFIL: software package for recursive digital filtering.** Harris, D. (Lawrence Livermore National Lab., CA (USA)). 10 Apr 1981. Contract W-7405-ENG-48. 44p. NTIS, PC A03/MF A01.

The purpose of this software package is to provide basic recursive digital filtering capabilities. The subroutines provided design and implement four kinds of filters: lowpass, highpass, bandpass and bandreject filters. The package is designed to be used by making a single call to the main subroutine RECFIL from the user's code. The interface is very simple and under the control of the user.

19612 **(UCRL—15312) Host-to-host encryption using commercial networking products.** (California Univ., Berkeley (USA)). 6 Oct 1980. Contract W-7405-ENG-48. 43p. NTIS, PC A03/MF A01.

The report considers three commercial devices in a setting of host-to-host encryption. The basic questions considered are: (1) can this local networking product be modified to provide host-to-host encryption; (2) how could host-to-host encryption be achieved without modifying this local networking product. The HYPERchannel adapter from Network Systems Corporation, the Net/One from Ungermann-Bass, and the Computrol's Megalink product are each be examined. Section 2 discusses the general issues of host-to-host encryption. A generic host-to-host cryptosystem is developed, to be used later in the analysis of the specific products. Section 3 presents in turn the HYPERchannel, Net/One, and Megalink, considering the possibilities of host-to-host encryption with and without product modification. The report's conclusions are summarized in Section 4.

19613 (UCRL—15336) Praxis input/output interface. Shapiro, R.E.; Evans, A. Jr. (Bolt, Beranek and Newman, Inc., Cambridge, MA (USA)). Jan 1981. Contract W-7405-ENG-48. 43p. NTIS, PC A03/MF A01.

This document is intended as an introduction to the use of RMS facilities via Praxis (this interface hereafter called Praxis-RMS). It is presumed that the reader is familiar with Praxis conventions as well as with RMS use (at the MACRO level). Since Praxis-RMS was designed to be functionally equivalent to MACRO-RMS, the explanations follow the pattern of the DEC MACRO-RMS documentation (particularly the programmer's reference manual). A complete list of the procedures that make up Praxis-RMS appears at the end of this document (with parameters), along with the constants (grouped by type) that can be used as actual parameters.

19614 (UCRL—84954) Hydrodynamics, megaflops, and multiprocessors. Rudy, T.E. (Lawrence Livermore National Lab., CA (USA)). 8 Oct 1980. Contract W-7405-ENG-48. 20p. (CONF-810603—1). NTIS, PC A02/MF A01.

From Conference on analyzing problem-classes and programming for parallel computing; Nuernberg, F.R. Germany (10 Jun 1981).

The potential performance of a simple, two-dimensional, finite-difference, time-dependent program on a variety of hypothetical MIMD (multiple instruction, multiple data) machines is analyzed. This paper addresses the bandwidth between a global memory and the processing elements as a function of processor characteristics and extrapolated performance. Although the partitioning of the fully explicit program at the procedure level is relatively trivial, the penalties for synchronization, summing global variables, and performing I/O (input/output) are ignored. The issues associated with the availability of a very high-speed computing capability and distributed processing are also discussed.

19615 (UCRL—85293(Rev.1)) ODE solvers for use with the method of lines. Hindmarsh, A.C. (Lawrence Livermore National Lab., CA (USA)). Mar 1981. Contract W-7405-ENG-48. 7p. (CONF-810628—1(Rev.1)). NTIS, PC A02/MF A01.

From IMACS symposium on computer methods for PDE's; Bethlehem, PA, USA (30 Jun 1981).

The numerical method of lines for time-dependent PDE's or PDE systems requires effective and flexible solvers for systems of ordinary differential equations (initial value problem). The ODE system can be explicit or implicit in form, and is typically large, complex and stiff. Various solvers have been written and used in this context, most using the BDF (Backward Differentiation Formula) methods first introduced in software form by C.W. Gear. Recently, two new solvers have been developed and released, in which flexibility, portability, and ease of use (both generally and for method of lines applications) were prime design criteria: LSODE solves explicit systems $y = f(t,y)$, and LSODI solves linearly implicit systems $A(t,y)\ y = g(t,y)$, where A is a square matrix. These solvers are described briefly here, and their uses illustrated by example PDE problems.

19616 (UCRL—85442) High speed scientific computers and implicit methods for solving partial differential equations. Kershaw, D.S. (Lawrence Livermore National Lab., CA (USA)). 1981. Contract W-7405-ENG-48. 12p. (CONF-810334—2). NTIS, PC A02/MF A01.

From Workshop on high speed computing; Gleneden Beach, OR, USA (31 Mar 1981).

General considerations of cost and useful life before modification are considered for large scientific mainframes. Implicit methods of problem solution of simulations are explained as a way of going beyond explicit methods in which Δt must be held to some small value. With implicit methods, Δt can be chosen appropriate to the rate of evolution of the physical process being studied. (GHT)

19617 (UCRL—85909) 3D simulation of a nose cone crushing. Brown, B.E.; Hallquist, J.O. (Lawrence Livermore National Lab., CA (USA)). Apr 1981. Contract W-7405-ENG-48. 6p. NTIS, PC A02/MF A01.

The nose cone shown represents a recently completed cooperative effort between the Department of Energy's Lawrence Livermore and Sandia National Laboratories. Various parts of weapons, such as this stainless steel nose cone, are designed to mitigate kinetic energy when impacting on hard surfaces. A redesign was necessitated when changes in the impact velocity required the nose cone to absorb more energy.

9903 Information Handling

REFER ALSO TO CITATION(S) 18772, 19036

19618 (BDX—613-2576) Bit-parallel ASCII code artificial numeric keypad. Hale, G.M. (Bendix Corp., Kansas City, MO (USA)). Mar 1981. Contract AC04-76DP00613. 15p. NTIS, PC A02/MF A01.

Seven integrated circuits and a voltage regulator are combined with twelve reed relays to allow the ASCII encoded numerals 0 through 9 and characters "." and R or S to momentarily close switches to an applications device, simulating keypad switch closures. This invention may be used as a PARALLEL TLL (Transistor Transistor Logic) data acqusition interface to a standard Hewlett-Packard HP-97 Calculator modified with a cable.

19619 (CONF-810227—3) Management of quality-assurance controls: decision support systems. Farrell, M.P.; Strand, R.H. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 5p. NTIS, PC A02/MF A01.

From SAS users group international meeting; Lake Buena Vista, FL, USA (8 Feb 1981).

Portions of document are illegible.

Environmental research involved in the assessment of new coal conversion technologies must evaluate many biological, physical and chemical variables to determine environmental acceptability. Inherent in these studies is the use of quality assurance controls to evaluate data base entries, analytical procedures, and program productivity. However, quality assurance controls implemented at the project level are seldom known in detail and/or evaluated when making resource management decisions at the program level. This paper presents a computer based decision support system that assists in management level integration of complex environmental research. The DSS is modeled after an open-ended construct applied to data management systems developed for environmental research programs, i.e., minimal planning effort and a flexible system that can accommodate changing research emphasis. We have found that by interfacing the DSS with the research data base management system, more appropriate statistical measures can be formulated to provide management support for evaluating program progress, status reports of current findings, and comparisons of findings with standards.

19620 (DOE/ER/10516—T8) Updating scientific information through key publications. Signell, P. (Michigan State Univ., East Lansing (USA)). 9 Apr 1981. Contract AC02-79ER10516. 9p. NTIS, PC A02/MF A01.

This primer shows how to quickly update scientific information in a particular area, using a key publication from that area. The method presented here, using a key publication avoids the usual frustrating search for all possible key words that might have been used by the persons who stored the data.

19621 (LBL—11860) Proceedings of the fifth Berkeley conference on distributed data management and computer networks. (Lawrence Berkeley Lab., CA (USA)). 1981. Contract W-7405-ENG-48. 293p. (CONF-810202—). NTIS, PC A13/MF A01.

From 5. Berkeley workshop on distributed data management and computer networks; Berkeley, CA, USA (3 Feb 1981).

Sessions were held on query processing, distributed applications, concurrency control, data base availability, distributed data base systems, network communication, network file systems, and distributed operating systems. (GHT)

19622 **(UCRL—85853) Technology information system review.** Spogen, L.R.; Hampel, V.E.; Raymond, J.R. (Lawrence Livermore National Lab., CA (USA); Battelle Pacific Northwest Labs., Richland, WA (USA)). 16 Apr 1981. Contract W-7405-ENG-48. 20p. (CONF-810459—1). NTIS, PC A02/MF A01.

From Technical and economic analysis contractors' meeting; Chicago, IL, USA (21 Apr 1981).

The Technology Information System (TIS) is being developed as part of the Transportation Systems Research (TSR) program at Lawrence Livermore National Laboratory (LLNL). The TIS project has for the most part been sponsored by the Technical and Economic Analysis (TEA) Branch of the US Department of Energy (DOE) Office of Applied Conservation Technology (ACT). The goal of TIS is to provide ACT and its contractors the capability to readily access, develop, and utilize information needed in the R and D decision-making process and the conduct of resultant R and D projects. The objective of this paper is to: describe the status of TIS, show work accomplished during the past year, and show the implication of present efforts on the future TIS system.

CORPORATE INDEX

In the Corporate Index, report literature is indexed using the name of the organization or institution responsible for issuing the report. Headings are provided for all report literature and for published literature for which a corporate approach is especially desirable, e.g., symposium and conference proceedings.

Each entry under a corporate heading gives the report title and the volume and abstract numbers. Report numbers, if applicable, are given in parentheses at the end of the entry.

DOE Energy Information Data Base: Corporate Author Entries (TID-4585) is used in the standardization of corporate entries. TID-4585 is available for purchase from the National Technical Information Service (NTIS), U. S. Department of Commerce, Springfield, Virginia 22161.

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Acurex Corp., Mountain View, CA (USA). Energy and Environmental Div.
Advanced pulverized-coal combustor for control of NO/sub x/ emissions. Second quarterly report, December 25, 1980-April 3, 1981, 6:19098 (DOE/PC/30296—2)

Adams (Samuel S.) and Associates, Boulder, CO (USA)
Geology and recognition criteria for veinlike uranium deposits of the lower to middle Proterozoic unconformity and strata-related types. Final report, 6:18068 (GJBX—5(81))
National uranium resource evaluation. Geology and recognition criteria for sandstone uranium deposits of the salt wash type, Colorado Plateau Province. Final report, 6:18069 (GJBX—6(81))

Advanced Mechanical Technology, Inc., Newton, MA (USA)
Occupancy-counter-based control system. Final report, 6:18826 (DOE/CS/20076—T1)

Aerospace Research Corp., Roanoke, VA (USA)
Development of wood as an alternative fuel for large power generating systems, 6:19097 (DOE/ET/20058—T1)

Airco Superconductors, Carteret, NJ (USA)
Development of manufacturing capability for the fabrication of the Nb_3Sn superconductor for the High Field Test Facility. Final report, 6:19075 (UCRL—15339)

AiResearch Mfg. Co., Los Angeles, CA (USA)
Near-term electric test vehicle ETV-2. Phase II. Final report, 6:18930 (DOE/CE/51213—01)

Air Force Inst. of Tech., Wright-Patterson AFB, OH (USA)
Functional modelling for logic simulation, 6:19605 (SAND—80-2735C)

Alabama Univ., Huntsville (USA). Dept. of Mechanical Engineering
Numerical and experimental studies of liquid storage tank thermal stratification for a solar energy system, 6:18487 (DOE/CS/34479—3)

Alaska Univ., Fairbanks (USA). Geophysical Inst.
Carbon dioxide in Arctic and subarctic regions, 6:19197 (DOE/EV/10429—1)
Carbon dioxide in Arctic and subarctic regions, 6:19234 (DOE/EV/10429—2)
Operation of a telemetered seismic network on the Alaska Peninsula. Annual report, 6:19389 (DOE/ER/70006—7)

Altas Corp., Santa Cruz, CA (USA)
Proceedings of the fourth annual geothermal conference and workshop, 6:18508 (EPRI-TC—80-907)

Ames Lab., IA (USA)
Coal and ash blend analysis of a bituminous and a subbituminous coal, 6:17962 (DOE/TIC—11440)
Normal spectral emissivities of liquid iron, liquid nickel, and liquid iron-nickel alloys, 6:18960 (IS-T—927)

Amoco Oil Co., Naperville, IL (USA). Research and Development Dept.
Study of ebullated-bed fluid dynamics for h-coal. Quarterly progress report No. 2, October 1-December 31, 1980, 6:17914 (DOE/PC/30026—2)

Amoco Production Co., Tulsa, OK (USA)
First joint SPE/DOE symposium on enhanced oil recovery, proceedings supplement, 6:17974 (CONF-800411—(Suppl.))

AN SSSR, Novosibirsk. Inst. Yadernoj Fiziki
Gas efficiency of surface-plasma sources of negative hydrogen ions, 6:19536 (UCRL-Trans—11673)
Plasma stability and potential distribution in the Thermal barrier of an ambipolar trap, 6:19511 (UCRL-Trans—11674)
Transverse diffusion of plasma in/on the disintegration of drift surfaces in axially asymmetric plasma traps, 6:19510 (UCRL-Trans—11672)

Argonne National Lab., IL (USA)
Computer simulation of the diffusion behavior of an ordered adsorbate, 6:19021 (CONF-800561—3)
Design and test results of a pulsed quadrupole magnet with a 2 μs rise time, 6:19118 (BNL—29317)
Energy and materials use in the production and recycling of consumer-goods packaging, 6:18816 (ANL/CNSV-TM—58)
Environmental monitoring at Argonne National Laboratory. Annual report for 1980, 6:19224 (ANL—81-23)
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Exotic multiquark states with charm, 6:19455 (FERMILAB-Conf—80/101-THY)
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ICECO-CEL: a coupled Eulerian-Lagrangian code for analyzing primary system response in fast reactors, 6:18612 (ANL—81-9)
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Peak-load pricing and thermal energy storage, 6:18708 (CONF-790748—)
Plasma sheath region near a boundary with positive ion backscattering, 6:19512 (ANL/FPP/TM—142)
Process engineering and economic evaluations of diaphragm and membrane chlorine cell technologies. Final report, 6:18848 (ANL/OEPM—80-9)
Radiological and Environmental Research Division. Annual report, January-December 1979, 6:19184 (ANL—79-65(Pt.4))
Survey and documentation of emerging technologies for the satellite power system (SPS), 6:18303 (DOE/ER—0097)
Tokamak reactor studies, 6:19537 (ANL/FPP/TM—143)
Transient current distributions in porous zinc electrodes in KOH electrolyte, 6:18726 (ANL/OEPM—80-6)
US/USSR cooperative program in open-cycle MHD electrical power generation: joint test report No. 4. Tests in the U-25B facility: MHD generator tests No. 6 and 7, 6:18774 (ANL-IVTAN-JT—4)
Who needs baryon spectroscopy, 6:19454 (FERMILAB-CONF—80/98-THY)
Why most flavor dependence predictions for nonleptonic charm decays are wrong. Flavor symmetry and final state interactions in nonleptonic decays of charmed hadrons, 6:19451 (FERMILAB-Conf—80/99-THY)

Arizona State Univ., Tempe (USA). Coll. of Engineering and Applied Sciences
Conversion of wood residues to diesel fuel, 6:18255 (COO—2982-67)

Arizona State Univ., Tempe (USA). Dept. of Mechanical and Energy Systems Engineering
Simplified design guide for estimating photovoltaic flat array and system performance, 6:18306 (SAND—80-7189)

Associated Architects of Crested Butte, CO (USA)
Gunnison County Airport Terminal solar cooperative agreement, 6:18348 (DOE/CS/30339—1)

Auburn Univ., AL (USA). Coal Conversion Lab.
Studies in coal liquefaction with application to the SRC and related processes. Quarterly report, May-July 1980, 6:17922 (FE—3397-7)
Studies in coal liquefaction with application to the SRC and related processes. Quarterly report, August-October 1980, 6:17923 (FE—3397-8)
Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.
March 1981 environmental data for sites in the National Solar Data network, 6:18250 (SOLAR/0010—81/03)
Solar energy system performance evaluation, Living Systems, Davis, California, October 1979-February 1980, 6:18374 (SOLAR/1046—80/14)
Solar energy system performance evaluation, M.F. Smith, Jamestown, Rhode Island, October 1979-April 1980, 6:18375 (SOLAR/1056—80/14(Rev.))

B

Babcock and Wilcox Co., Lynchburg, VA (USA)
Axial blanket fuel design and demonstration. First semiannual progress report, January-September 1980, 6:18585 (DOE/ET/34020—1)
Axial blanket fuel design and demonstration. First semi-annual progress report, January-September 1980, 6:18586 (DOE/ET/34020—1)
Battelle Columbus Labs., OH (USA)
CaO interactions in the staged combustion of coal. Second quarterly technical progress report, January 1, 1981-March 31, 1981, 6:17961 (DOE/PC/30301—2)
Battelle Memorial Inst., Columbus, OH (USA). Office of Nuclear Waste Isolation
Estimated environmental effects of deep drilling, 6:18114 (ONWI—13)
Battelle Pacific Northwest Labs., Richland, WA (USA)
Assessment of effectiveness of geologic isolation systems. A conceptual simulation model for release scenario analysis of a hypothetical site in Columbia Plateau Basalts, 6:18117 (PNL—2892)
Characterization of transuranium: contaminated solid wastes residues, 6:18096 (PNL—3776)
Cost benefits from applying advanced heat rejection concepts to a wet/dry-cooled binary geothermal plant, 6:18513 (PNL—3419)
Fuel performance improvement program. Semiannual progress report, April-September 1980, 6:18577 (DOE/ET/34215—19)
HADOC: a computer code for calculation of external and inhalation doses from acute radionuclide releases, 6:19313 (PNL—3503)
Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 5. Environmental assessment, control, health and safety, 6:19247 (PNL—3700(Pt.5))
Probabilistic estimates of US uranium supply, 6:18071 (PNL—3595)
Radiological status of the ground water beneath the Hanford Site, January-December 1980, 6:19239 (PNL—3768)
Safety analysis report for the Hanford Critical Mass Laboratory: Supplement No. 2. Experiments with heterogeneous assemblies, 6:19378 (PNL—3749)
Supplement to safety analysis report: 306W Building clean room and assembly area, 6:19377 (PNL—2549(Supp.2))
Technology information system review, 6:19622 (UCRL—85853)
Bendix Corp., Kansas City, MO (USA)
Aluminum alloy welding and stress-corrosion testing. Final report, 6:18953 (BDX—613-2543)
Bit-parallel ASCII code artificial numeric keypad, 6:19618 (BDX—613-2576)
Software documentation for compression-machine cavity control, 6:19057 (BDX—613-2603)
Bendix Field Engineering Corp., Grand Junction, CO (USA)
DOE/Simplec magnetic susceptibility logging system, 6:19160 (GJBX—75(81))
Summary geologic report on the Missoula/Bitterroot Drilling Project, Missoula/Bitterroot Basins, Montana, 6:18072 (GJBX—7(81))
Survey of lands held for uranium exploration, development, and production in fourteen western states in the six-month period ending December 31, 1980, 6:18070 (GJBX—79(81))
Bendix Field Engineering Corp., Grand Junction, CO (USA). Grand Junction Operations
National uranium resource evaluation: Williams quadrangle, Arizona, 6:18081 (GJQ—009(81))
Bhabha Atomic Research Centre, Bombay (India). Radiation Technology and Industrial Applications Section
Proceedings of the workshop on radiation treatment of sewage sludge, 6:19275 (CONF-8004149—)
Bickle/CM, Inc., Albuquerque, NM (USA)
Solar heating system at the office of Burns/Peters Architects. Final technical report, 6:18351 (DOE/CS/32127—T1)
Boeing Co., Seattle, WA (USA)
EXAFS studies of the local atomic environment in metal-metal glasses, 6:18956 (CONF-8006158—2)
Bolt, Beranek and Newman, Inc., Cambridge, MA (USA)
Praxis input/output interface, 6:19613 (UCRL—15336)
Bower (Sid), Las Vegas, NV (USA)
Home Energy Management Devices. Final report, 6:18831 (DOE/SF/01983—T1)
Brobeck (William M.) and Associates, Berkeley, CA (USA)
Correlation of the results of shock-initiation tests, 6:19180 (UCRL—85000)
Delayed detonation in propellants from low-velocity impact, 6:19179 (UCRL—84999)
Brookhaven National Lab., Upton, NY (USA)
BNL neutral beam development group. Progress report FY 1980, 6:19540 (BNL—51368)
Comparison of vegetation patterns and soil nutrient relations in an oak-pine forest and a mixed deciduous forest on Long Island, New York, 6:19217 (BNL—51331)
Design and test results of a pulsed quadrupole magnet with a 2 μs rise time, 6:19118 (BNL—29317)
Fuel-cell applied research: electrocatalysis and materials. Quarterly report, January 1-March 31, 1980, 6:18808 (BNL—51319)
Heavy-ion injection from tandems into an isochronous cyclotron, 6:19104 (BNL—29199)
Laser-driven electron accelerators, 6:19106 (BNL—29329)
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Movable detector to search for neutrino oscillations in the BNL neutrino beam, 6:19439 (BNL—29357)
Multiobjective reservoir optimization via lake stratification modeling and constrained nonlinear programming, 6:19233 (BNL—29406)
Near-resonant vibration → vibration energy transfer under single-collision conditions, 6:19033 (BNL—28756)
Neutrino mass and unification, 6:19453 (BNL—29092)
Neutron-transport equation in a general curvelinear coordinate system, 6:19538 (BNL—28899)
Overview of experimental tests of the IBA, 6:19488 (BNL—29137)
Peak-power dependence of rovibronic populations below the quasicontinuum during IR multiphoton absorption, 6:19429 (BNL—28758)
Proceedings of the symposium on heavy ion physics from 10 to 200 MeV/amu, 6:19467 (BNL—51115(Vol.1))
Proceedings of the symposium on heavy ion physics from 10 to 200 MeV/AMU, 6:19470 (BNL—51115(Vol.2))
Results of parametric neutronic studies for high-temperature blankets with breeding, 6:19539 (BNL—28903)
Review of fusion/high-temperature electrolysis process, 6:18133 (BNL—29049)
Role of temperate forest heterogeneity in determining the population ecology of Peromyscus leucopus, 6:19218 (BNL—51332)
Thermodynamic and electronic properties of liquid Na-Bi alloys, 6:18954 (BNL—29058)
Two-lump fission product model for fast reactor analysis, 6:18598 (BNL—28902)
Brookhaven National Lab., Upton, NY (USA). National Center for Analysis of Energy Systems
Economics of cogeneration in commercial buildings, 6:18817 (BNL—29221)
Validation of the materials-process-product model (coal SNG), 6:17909 (BNL—51079)

Burns and Roe Industrial Services Corp., Paramus, NJ (USA)
Cost estimates supporting West Valley DEIS, 6:18092 (DOE/ET/44207—2)
West Valley feasibility study, 6:18091 (DOE/ET/44207—1)

C

California Energy Commission, Sacramento (USA)
Availability of western coal for California use. Final report, 6:18751 (P—300-80-037)
California and world oil: the strategic horizon, 6:18036 (P—300-81-002)
California plan for the residential conservation service, 6:18839 (P—400-81-001)
Decision on the Northern California Power Agency's application for certification for Geothermal Project No. 2, 6:18505 (P—800-80-002)
Exploring new energy choices for California: the 1981/82 report to the legislature. Staff report, 6:18740 (P—500-81-016)
Guide to energy budgets. Division two. Energy conservation standards for new non-residential buildings, 6:18838 (P—400-80-066)
Nonresidential energy efficiency in California: achieving a 20% improvement by 1985. Volume I. Executive summary and action plan; Volume II. Technical report, 6:18837 (P—400-80-065)
Regulations for the California solar energy tax credit. These regulations apply to solar systems installed during 1981, 6:18252 (P—500-81-009)
Regulations for the California tax credit. These regulations apply to conservation measures installed during 1981, 6:18840 (P—400-81-002)
SCE coal gasification demonstration project. Revised draft environmental impact report, 6:17941 (P—700-79-010)
California State Univ., Hayward (USA). Dept. of Biological Sciences
Salton Sea sampling program: baseline studies, 6:18507 (UCRL—15343)
California Univ., Berkeley (USA)
Host-to-host encryption using commercial networking products, 6:19612 (UCRL—15312)
California Univ., Irvine (USA)
Effect of solid particles on the turbulent flow of a round gaseous jet: a mathematical and experimental study. Quarterly technical progress report, October 1-December 31, 1980, 6:19084 (DOE/PC/30303—T1)
California Univ., Livermore (USA). Lawrence Livermore Lab.
Analysis of bolt reinforcement in rock slopes, 6:19408 (UCRL—85871)
Computational compact torus experiment, 6:19562 (UCID—18827)
Contingency plan for the Lawrence Livermore National Laboratory's hazardous-waste operations, 6:19381 (UCID—18996)
Evaluation of reservoir properties in a portion of the Salton Sea Geothermal Field, 6:18520 (UCRL—52756)
Finite-element calculations of near-field transient horizontal temperature and thermal stress distributions for the Climax granite nuclear spent-fuel-storage experiment, 6:18086 (UCID—18840)
Spill exercise 1980: an LLNL emergency training exercise, 6:19382 (UCRL—52939)
California Univ., Livermore (USA). Lawrence Livermore National Lab.
Formation of negative hydrogen ions in surface and volume processes, 6:19570 (UCRL—85589)
California Univ., Los Angeles (USA). Dept. of Geology
Carbon and oxygen isotopes in apatite CO_2 and co-existing calcite, 6:19410 (DOE/EV/70134—T3)
California Univ., Los Angeles (USA). Lab. of Biomedical and Environmental Sciences
Community applications of small-scale solar-thermal energy systems, 6:18323 (UCLA—12/1279)
California Univ., Santa Barbara (USA). Dept. of Chemistry
Photoelectrochemistry at iron oxide electrodes. Progress report, 6:18257 (DOE/ER/10369—T1)
Canadian Society for Chemical Engineering, Ottawa
Proceedings of the coal and coke sessions, 6:17950 (CONF-7810191—)
Carnegie-Mellon Univ., Pittsburgh, PA (USA). Dept. of Civil Engineering
Adsorptive behavior of polycyclic aromatic hydrocarbons in coal-conversion wastewaters. Six months progress report, 6:19235 (DOE/PC/30246—T1)
CEA Centre d'Etudes Nucleaires de Grenoble, 38 (France)
Electrolytic production of hydrogen by electrochemical reduction of water at 850°C. Construction and determination of the characteristics of an electrolysis cell surface of 50 cm^2. Final report, 6:18141 (EUR—6987-FR)
Chevron Oil Field Research Co., La Habra, CA (USA)
NMR determination of porosity and permeability of western tight gas sands, 6:18047 (SAND—80-2351C)
Chrysler Corp., Detroit, MI (USA)
Baseline automotive gas-turbine engine development program. Final report, 6:18913 (DOE/NASA/2749—79/1)
Conceptual design study of an improved automotive gas-turbine powertrain. Final report, 6:18914 (DOE/NASA/2749—79/3)
Materials review for improved automotive gas-turbine engine. Final report, 6:18915 (DOE/NASA/2749—79/4)
Colorado Univ., Boulder (USA). Dept. of Chemistry
Laser photoelectron spectroscopy of ions. Progress report, 6:19010 (DOE/ER/10722—T1)
Columbia Gas System Service Corp., Columbus, OH (USA)
Columbia-DOE 10-well project. Technical progress report, 6:18048 (DOE/MC/08385—T10)
Columbia Univ., Palisades, NY (USA). Lamont-Doherty Geological Observatory
Coral growth rings and the temporal history of nuclear $^{14}C/C$ $^{90}Sr/Sr$ in the surface ocean. Progress report, February 1, 1980-January 31, 1981, 6:19236 (DOE/ER/02271—T1)
Cornell Univ., Ithaca, NY (USA)
Ethanol production in southwestern New York: technical and economic feasibility. Final report, 6:18264 (NYSERDA—81-3)
Corps of Engineers, Washington, DC (USA)
Waterpower '79: the first international conference on small-scale hydropower, 6:18147 (CONF-791056—)
Curtiss-Wright Corp., Wood-Ridge, NJ (USA). Power Systems Div.
Design, construction, operation and evaluation of a Prototype Culm Combustion Boiler/Heater Unit. Quarterly technical progress report, July 1-September 30, 1980, 6:17963 (FE—3269-36)
High temperature turbine technology program. Phase II. Technology test and support studies. Annual technical progress report, January 1, 1979-December 31, 1979, 6:18536 (DOE/ET/10348—T1)

D

Dames and Moore, Burlington, MA (USA)
Program DAMSWEL: programming manual, code verification, program listing, 6:18097 (RHO-BWI-C—74)
Dayton Univ., OH (USA)
Electron and photon interactions with $KClO_4$, 6:19040 (MLM—2806(OP))
Delaware Geological Survey, Newark (USA)
Preliminary targeting of geothermal resources in Delaware. Progress report, July 15, 1979-May 30, 1980, 6:18499 (DOE/ET/28416—2)
Delaware Univ., Newark (USA). Inst. of Energy Conversion
Zn_3P_2 as an improved semiconductor for photovoltaic solar cells. Ninth quarterly report, September 1, 1980-November 31, 1980, 6:18273 (SERI/PR—9062-1-T5)
Department of Agriculture, Clay Center, NE (USA). Meat Animal Research Center
Anaerobic fermentation of beef cattle manure. Final report, 6:18280 (SERI/TR—98372-1)
Department of Energy, Bartlesville, OK (USA). Bartlesville Energy Technology Center
Aviation turbine fuels, 1980, 6:18040 (DOE/BETC/PPS—81/2)
First joint SPE/DOE symposium on enhanced oil recovery, proceedings supplement, 6:17974 (CONF-800411—(Suppl.))

Motor gasolines, summer 1980, 6:18039 (DOE/BETC/PPS—81/1)
Symposium on enhanced oil recovery, 6:17983 (CONF-810438—)

Department of Energy, Morgantown, WV (USA). Morgantown Energy Technology Center
Evaluation of the sulfur sorption properties of chemically improved limestones during fluidized-bed combustion, 6:17960 (DOE/METC/RI—128)

Department of Energy, Oak Ridge, TN (USA). Technical Information Center
Appropriate technology: a bibliography, 6:18732 (DOE/TIC—3385)

Department of Energy, Washington, DC (USA)
Waterpower '79: the first international conference on small-scale hydropower, 6:18147 (CONF-791056—)

Department of Energy, Washington, DC (USA). Div. of Chemical Sciences
Stable isotope research pool inventory, 6:18134 (DOE/NDC—13(Rev.))

Department of Energy, Washington, DC (USA). Div. of Energy Storage Systems
Peak-load pricing and thermal energy storage, 6:18708 (CONF-790748—)

Department of Energy, Washington, DC (USA). Office of Fusion Energy
Damage analysis and fundamental studies. Quarterly progress report, October-December 1980, 6:19544 (DOE/ER—0046/4(Vol.1))

Department of Energy, Washington, DC (USA). Office of Safeguards and Security
Semi-annual report on strategic special nuclear material inventory differences, 6:18120 (DOE/DP—0001-7)

Dikewood Corp., Albuquerque, NM (USA)
CONFLOW: a computer code describing flow between two wells in a confined region, 6:19385 (SAND—80-1645)

Duke Univ., Durham, NC (USA)
Assessment of active solar systems in the residential sector of North Carolina: 1974-1995, 6:18361 (NCEI—0030)

Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.
Environmental Transport Division. 1980 report, 6:19211 (DP—1593)
^{238}Pu fuel form processes. Quarterly report, January-March 1980, 6:18136 (DPST—80-128-1)
^{238}Pu fuel form processes quarterly report, April-June 1980, 6:18137 (DPST—80-128-2)

Duquesne Univ., Pittsburgh, PA (USA). Dept. of Chemistry
Hydrogen bonding in asphaltenes and coal liquids. Quarterly report, 1 February-30 April 1981, 6:17932 (DOE/PC/30252—T3)

Dynalysis of Princeton, NJ (USA)
Gulf of Mexico numerical model. Project summary, 6:18341 (DOE/ET/20612—T1)

E

ECON, Inc., Princeton, NJ (USA)
Evaluation of higher distribution and/or utilization voltages. First interim report (December 1978): literature search and problem definition, 6:18559 (DOE/CE/20505—2)
Evaluation of higher distribution and/or utilization voltages. Second interim report (March 1979): identification of components and parameters for cost and energy-efficiency analysis, 6:18560 (DOE/CE/20505—3)
Evaluation of higher distribution and/or utilization voltages. Fourth interim report (August 1980): assessment of optimum distribution configuration, 6:18562 (DOE/CE/20505—5)
Evaluation of higher distribution and/or utilization voltages. Third interim report (October 1979): analysis of individual component cost and/or energy efficiencies, 6:18561 (DOE/CE/20505—4)
Evaluation of higher distribution and/or utilization voltages. Fifth interim report (September 1980): assess constraints to higher voltage implementation, 6:18563 (DOE/CE/20505—6)

EG and G GeoMetrics, Sunnyvale, CA (USA)
Aerial gamma ray and magnetic survey: Gainesville and Daytona Beach quadrangles, Florida. Final report, 6:18077 (GJBX—101(81))
Aerial gamma ray and magnetic survey: Louisville quadrangle, Indiana, Ohio, and Kentucky. Final report, 6:18074 (GJBX—94(81))
Aerial gamma ray and magnetic survey: Tarpon Springs and Orlando quadrangles, Florida. Final report, 6:18080 (GJBX—104(81))
Aerial gamma ray and magnetic survey: Valdosta and Jacksonville quadrangles, Georgia and Florida. Final report, 6:18076 (GJBX—100(81))
Aerial gamma ray and magnetic survey: Waycross and Brunswick quadrangles, Georgia. Final report, 6:18079 (GJBX—103(81))
Aerial gamma ray and magnetic survey: West Palm Beach quadrangle, Florida. Final report, 6:18078 (GJBX—102(81))

EG and G Idaho, Inc., Idaho Falls (USA)
Fault-tree construction on the INEL CAD system, 6:19591 (EGG-IS—5376)
High efficiency particulate removal with sintered metal filters, 6:19196 (CONF-810319—2)
Interactive reliability analysis project. FY 80 progress report, 6:18614 (EGG-IS—5341)

EG and G, Inc., Goleta, CA (USA)
New scintillators for fiber optics: system sensitivity and bandwidth as a function of fiber length, 6:19153 (LA-UR—81-171)

EG and G, Inc., Las Vegas, NV (USA). Energy Measurements Group
Aerial radiological survey of the Davis-Besse Nuclear power Station and surrounding area, Oak Harbor, Ohio. Date of survey: 26-29 May 1980, 6:19226 (EGG—1183-1769)
Aerial radiological survey of the Fermi National accelerator Laboratory and surrounding area, Batavia, Illinois. Data of survey: 12-14 May 1977, 6:19227 (EGG—1183-1775)

Eisenstadt (Mel) and Associates, Inc., Albuquerque, NM (USA)
Performance warranties for residential and light-commercial photovoltaic systems, 6:18307 (SAND—81-7008)

Electric Power Research Inst., Palo Alto, CA (USA)
Alternative futures: choices and uncertainties, 6:18739 (EPRI-EA—1541-SR)

Electric Power Research Inst., Palo Alto, CA (USA). Systems and Materials Dept.
LWR core materials performance program: progress in 1979-1980, 6:18578 (EPRI-NP—1770-SR)

Eltra Corp., Plymouth Meeting, PA (USA). C and D Batteries Div.
Research, development, and demonstration of lead-acid batteries for electric vehicle propulsion. Annual report, 1980, 6:18928 (ANL/OEPM—80-10)

ENCOTH Corp., Princeton, NJ (USA)
Sensitivity of the current-voltage characteristic to diode parameters, 6:19058 (DOE/ET/15422—7)

Energy Action, Santa Cruz, CA (USA)
Wood-fired cogeneration system for University of California, Santa Cruz. Final report, 6:18830 (DOE/SF/01937—T1)

Energy and Environmental Research Corp., Santa Ana, CA (USA)
Assessment of pulverized-coal-fired combustor performance. Models for coal-combustor performance: analytical tool verification, 6:19099 (DOE/PC/30297—T2)

Energy Research Associates, Oakland, CA (USA)
Continuous-band Nitinol heat engine. Final report, 6:18313 (DOE/SF/01982—T1)

Energy Technology Support Unit, Harwell (UK)
Dissaggregated model of energy consumption in UK industry, 6:18903 (ETSU-R—8)

Envirodyne Ltd., Waterloo, Ontario (Canada)
Investigation of numerical modeling techniques for recirculating flows. Parts 1 and 2. Final report, February 1981, 6:18541 (EPRI-CS—1665(Pts.1-2))

Environmental Protection Agency, Washington, DC (USA)
Review of the Department of Energy's conservation and solar energy programs: a report to the President and Congress, 6:18738 (EPA/600/7—81-001)

Envirosphere Co., Bellevue, WA (USA)
Estimated environmental effects of geologic and geophysical exploratory activities, 6:18115 (ONWI—105)

Envirosphere Co., New York (USA)
Appendices for program negative declaration for the Biomass Conversion Demonstration Program, 6:18266 (P—500-80-051(App))
Program negative declaration for the Biomass Conversion Demonstration Program, 6:18265 (P—500-80-051)
Equinox Design, Inc., Eugene, OR (USA)
Deadwood Community Center and Firehall, Deadwood, Oregon. Phase I. Design documentation report, 6:18347 (DOE/CS/30336—1)
Equity Oil Co., Salt Lake City, UT (USA)
BX in situ oil shale project. Annual technical progress report, March 1, 1979-February 29, 1980 and quarterly technical progress report, December 1, 1979-February 29, 1980, 6:18057 (DOE/LC/10747—11)
Ernst and Whinney, Washington, DC (USA)
Electric Utility Rate Design Study: embedded generation costs on a time-of-day basis for Iowa Southern Utilities Company, 6:18542 (NP—25352)
Exide Management and Technology Co., Yardley, PA (USA)
Research, development, and demonstration of lead-acid batteries for electric-vehicle propulsion. Annual report, 1980, 6:18929 (ANL/OEPM—80-11)
Exxon Nuclear Co., Inc., Richland, WA (USA)
Fuel performance improvement program. Semiannual progress report, April-September 1980, 6:18577 (DOE/ET/34215—19)
Exxon Research and Engineering Co., Florham Park, NJ (USA)
EDS coal liquefaction process development. Phase V. EDS commercial plant study design update. Illinois coal. Volume 1. Main report, 6:17910 (DOE/ET/10069—T1(Vol.1))
Exxon Research and Engineering Co., Linden, NJ (USA). Advanced Energy Systems Labs.
Thin-film polycrystalline silicon solar cells. Quarterly report no. 3, October 16, 1980-January 15, 1981, 6:18274 (SERI/PR—9077-1-T2)

F

Factory Mutual Research Corp., Norwood, MA (USA)
Ignitability of high-fire-point liquid spills. Final report, 6:19376 (EPRI-NP—1731)
Fermi National Accelerator Lab., Batavia, IL (USA)
Colliding beams: what is an appropriate mathematical approach, 6:19107 (FERMILAB-CONF—81/29-THY)
Exotic multiquark states with charm, 6:19455 (FERMILAB-Conf—80/101-THY)
Who needs baryon spectroscopy, 6:19454 (FERMILAB-CONF—80/98-THY)
Why most flavor dependence predictions for nonleptonic charm decays are wrong. Flavor symmetry and final state interactions in nonleptonic decays of charmed hadrons, 6:19451 (FERMILAB-Conf—80/99-THY)
Zeta-spectroscopy beyond 40 GeV, 6:19442 (FERMILAB-CONF—81/28-THY)
Flow Science, Inc., Los Alamos, NM (USA)
Numerical study of hot-leg ECC injection into the upper plenum of a pressurized water reactor, 6:18615 (LA-UR—81-875)
FMC Corp., Santa Clara, CA (USA). Engineered Systems Div.
High-angle-mining system. Task report: definition of system requirements, 6:17949 (DOE/ET/14257—T1)
Foundation Sciences, Inc., Portland, OR (USA)
Thermal/mechanical properties of Pomona and Umtanum basalts: elevated temperature comparative triaxial test, 6:19401 (RHO-BWI-C—91)
Thermal/mechanical properties of umtanum basalt: Borehole DC-2, 6:19402 (RHO-BWI-C—92)
Franklin Pierce Law Center, Concord, NH (USA). Energy Law Inst.
Financing of private small scale hydroelectric projects, 6:18235 (DOE/CE/04934—44)
Fraunhofer-Gesellschaft zur Foerderung der Angewandten Forschung e.V., Garmisch-Partenkirchen (Germany, F.R.). Inst. fuer Atmosphaerische Umweltforschung
Measurement of airborne radioactivity and its meteorological application. Part VIII. Annual report, 1 August 1976-31 October 1977 , 6:19210 (DOE/ET/03425—20)

G

Galaxy, Inc., Washington, DC (USA)
Studies on advanced overseas energy technologies. Volume II. Final report, 6:18901 (DOE/SF/10538—T8(Vol.2))
Studies on advanced overseas energy technologies. Volume I. Final report, 6:19100 (DOE/SF/10538—T8(Vol.1))
Garrett Energy Research and Engineering Co., Inc., Ojai, CA (USA)
Improved, inexpensive solar-energy-heating heat reservoir. Final report, 6:18488 (DOE/SF/01929—T2)
Garrett Turbine Engine Co., Phoenix, AZ (USA)
Analytical design of an advanced radial turbine, 6:18912 (DOE/NASA/0106—1)
General Accounting Office, Washington, DC (USA)
Management problems impede success of DOE's solar-energy projects, 6:18240 (EMD—81-10)
General Atomic Co., San Diego, CA (USA)
Gas-cooled fast breeder reactor. Quarterly progress report, August 1-October 31, 1979, 6:18590 (GA-A—15628(Add.))
Implications of materials behavior on design codes, 6:18588 (GA-A—16314)
Interaction of metals with primary coolant impurities: comparison of steam-cycle and advanced HTGRs, 6:18589 (GA-A—16319)
MBC, a ballooning stability code for finite toroidal mode number, 6:19519 (GA-A—16243)
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Optical thermography for a fusion tokamak neutral-beam injection system, 6:19546 (GA-A—16128)
Team One (GA/MCA) effort of the DOE 12-tesla coil-development program. Quarterly progress report, April 1- June 30, 1980, 6:19545 (GA-A—15902)
General Electric Co., San Jose, CA (USA). Nuclear Energy Engineering Div.
Improved uranium-utilization program, Phase I. First semiannual report, September 1979-March 1980, 6:18579 (GEAP—25332-1)
General Electric Co., Schenectady, NY (USA)
Reliability indexes for power systems. Final report, March 1981, 6:18568 (EPRI-EL—1773)
General Electric Co., Schenectady, NY (USA). Corporate Research and Development Dept.
EXAFS studies of the local atomic environment in metal-metal glasses, 6:18956 (CONF-8006158—2)
Near-term electric vehicle. Phase II. Final report, 6:18932 (SRD—79-076)
General Electric Co., Schenectady, NY (USA). Electric Utility Systems Engineering Dept.
Determining load characteristics for transient performance. Volume 3. Load-composition data analysis. Final report, 6:18564 (EPRI-EL—850(Vo.3))
Determining load characteristics for transient performance. Volume 4. Test results and analysis. Final report, 6:18567 (EPRI-EL—850(Vol.4))
Determining load characteristics for transient performance. Volume 1. Executive summary. Final report, 6:18565 (EPRI-EL—850(Vol.1))
Determining load characteristics for transient performance. Volume 2. Load-model guidelines. Final report, 6:18566 (EPRI-EL—850(Vol.2))
General Electric Co., Schenectady, NY (USA). Energy Systems Programs Dept.
Electrostatic granular bed filter development program. Quarterly technical report, July-September 1980, 6:18547 (FE—5490-10)
General Electric Co., Schenectady, NY (USA). Research and Development Center
Theoretical evidence for specificity of metal-metalloid interactions in Fe-Ni-P-B glasses, 6:19507 (CONF-8006158—1)
General Electric Co., Sunnyvale, CA (USA). Advanced Reactor Systems Dept.
Pebble Bed Reactor Plant screening evaluation. Overall plant and reactor system, 6:18597 (DOE/ET/35202—T1(Vol.1))
Geodata International, Inc., Dallas, TX (USA)
Aerial radiometric and magnetic survey: Grangeville National Topographic Map, Idaho, Oregon, and Washington. Rockies wrap-up project. Final report, 6:18075 (GJBX—98(81))

Geological Survey, Albuquerque, NM (USA)
Geohydrology of the proposed waste-isolation pilot-plant site in southeastern New Mexico, 6:19386 (SAND—81-0197C)
Geological Survey, Denver, CO (USA)
Geology of the Twinridge pluton area, Nevada Test Site, Nevada, 6:18103 (USGS-OFR—81-156)
NMR determination of porosity and permeability of western tight gas sands, 6:18047 (SAND—80-2351C)
Geological Survey, Menlo Park, CA (USA)
Hawaiian volcano observatory seismic network history 1950-1979, 6:19394 (USGS-OFR—80-302)
Geological Survey, Washington, DC (USA)
Estimated oil and gas reserves, Southern California Outer Continental Shelf, December 31, 1979, 6:17970 (USGS-OFR—80-1042)
Geophysical and lithologic logs of nine test holes drilled during 1978 in Harding County, South Dakota, 6:17944 (USGS-OFR—80-852)
Geomet, Inc., Gaithersburg, MD (USA)
Comparison of indoor and outdoor air quality. Final report, March 1981, 6:19199 (EPRI-EA—1733)
Geomet Technologies, Inc., Gaithersburg, MD (USA)
Wind energy resource atlas: Volume 6. The Southeast region, 6:18524 (PNL—3195-WERA-6)
Georgia Inst. of Tech., Atlanta (USA)
Geochemistry of ^{210}Pb in the southeastern, US estuarine system, 6:19411 (DOE/EV/00890—T3)
Georgia Inst. of Tech., Atlanta (USA). Research Inst.
Kinetic study of radical-aromatic hydrocarbon reactions. Annual progress report No. 3, 1 May 1980-31 March 1981, 6:19034 (DOE/ER/06030—T2)
Georgia Inst. of Tech., Atlanta (USA). School of Electrical Engineering
Absolute experimental cross sections for the electron impact single, double, triple, and quadruple ionization of Cs^+ ions. Final technical report, 6:19435 (ORNL/Sub—7802/1)

H

Hanford Engineering Development Lab., Richland, WA (USA)
Interlaboratory reaction rate program. 12th progress report, November 1976-October 1979, 6:19502 (HEDL-TME—79-58)
Path E alloys: ferritic material development for magnetic fusion energy applications, 6:19547 (HEDL-SA—2250)
Summary of HEDL Fusion Reactor Safety Support studies, 6:19548 (HEDL-SA—2360)
Harvard Univ., Cambridge, MA (USA). Energy and Environmental Policy Center
Markets during world oil supply crises: an analysis of industry, consumer, and governmental response, 6:18035 (DOE/PE/70106—T4)
Hawaii Community Design Center, Honolulu (USA)
Home Energy Saver's Handbook. Final report, 6:18829 (DOE/SF/01910—T1)
Hawaii Univ., Honolulu (USA). Dept. of Meteorology
Wind Energy Resource Atlas. Volume 11. Hawaii and Pacific Islands Region, 6:18525 (PNL—3195-WERA-11)
Hawaii Univ., Honolulu (USA). Dept. of Physics and Astronomy
Computer simulation of the DUMAND optical array, 6:19426 (UH—511-365-79)
Hawaii Univ., Honolulu (USA). Hawaii Natural Energy Inst.
Giant leucaena (koa haole) energy tree farm, 6:18261 (HNEI—80-06)
Hercules, Inc., Cumberland, MD (USA). Allegany Ballistics Lab.
Management implementation plan for a safety analysis and review system, 6:19375 (DOE/PC/30198—T2)
Hercules, Inc., Magna, UT (USA). Bacchus Works
Delayed detonation in propellants from low-velocity impact, 6:19179 (UCRL—84999)
Houston Univ., TX (USA). Energy Lab.
Description of the capabilities of the individual heliostat code, 6:18318 (DOE/SF/10763—T8)
Notes on collector field optimization: extensions of the basic theory, 6:18316 (DOE/SF/10763—T6)
Programmer's manual for the University of Houston computer code RCELL: cellwise optimization for the solar central receiver project, 6:18315 (DOE/SF/10763—T5)
User's manual for the University of Houston computer code-RC: cellwise optimization for the solar receiver project, 6:18317 (DOE/SF/10763—T7)
Hydrocoil, Inc., City of Commerce, CA (USA)
Waste-heat recovery system for commercial cooking appliances. Final report, 6:18900 (DOE/SF/01916—T1)

I

Idaho National Engineering Lab., Idaho Falls (USA)
RELAP5 two-phase fluid model and numerical scheme for economic LWR system simulation, 6:18613 (CONF-810355—1)
Illinois Inst. of Natural Resources, Champaign (USA). State Water Survey Div.
Atmospheric effects of cooling lakes. Final report, 6:18546 (EPRI-EA—1762)
Illinois Inst. of Tech., Chicago (USA)
Moisture penetration into composites under external stress, 6:18999 (COO—4440-8)
Illinois Inst. of Tech., Chicago (USA). Dept. of Chemical Engineering
Selective metal-ion extraction for multiple ion liquid-liquid exchange reactions. Progress report, March 1, 1980-February 28, 1981, 6:19009 (DOE/ER/10406—T2)
Illinois Inst. of Tech., Chicago (USA). Dept. of Chemistry
Studies of combustion kinetics and mechanisms, 6:19050 (DOE/ER/14953—1)
Illinois Univ., Chicago (USA). Energy Resources Center
Peak-load pricing and thermal energy storage, 6:18708 (CONF-790748—)
Illinois Univ., Urbana (USA). Dept. of Metallurgy and Mining Engineering
Diffusion of hydrogen, deuterium, and tritium in niobium, 6:18957 (DOE/ER/01198—1346)
Illinois Univ., Urbana (USA). Fusion Technology Lab.
Finite-orbit method for dynamic analysis of mirror fusion systems, 6:19513 (CONF-810415—5)
Inhalation Toxicology Research Inst., Albuquerque, NM (USA)
Safety assessment of spent-fuel transportation in extreme environments, 6:18118 (SAND—80-2043C)
Institute of Gas Technology, Chicago, IL (USA)
Solar-MEC Development Program. Project 61019 annual report, September 1, 1977-September 30, 1978, 6:18354 (DOE/CS/34495—T1)
Institut Francais du Petrole (IFP), 92 - Rueil-Malmaison
Heat pump operating with a mixture of fluids. Final report, 6:18832 (EUR—6848-FR)
Interactive Resources, Inc., Point Richmond, CA (USA)
Willow Park II Community Center. Overview of the design report for the passive solar commercial buildings design assistance and demonstration program, 6:18349 (DOE/CS/30361—T2)
International Atomic Energy Agency, Vienna (Austria)
Management of Alpha-Contaminated Wastes, 6:18102 (STI/PUB—562)

J

Jet Propulsion Lab., Pasadena, CA (USA)
Potential impacts of Brayton- and Stirling-cycle engines, 6:18927 (DOE/CS/51011—T1)
Johns Hopkins Univ., Baltimore, MD (USA)
Extreme ultraviolet and soft x-ray diagnostics of high-temperature plasmas. Annual progress report, October 1, 1980-September 30, 1981, 6:19514 (DOE/ET/53006—7)
Johns Hopkins Univ., Laurel, MD (USA). Applied Physics Lab.
Correlation of the results of shock-initiation tests, 6:19180 (UCRL—85000)

Johnson (Alfred L.), Manhattan Beach, CA (USA)
Solar powered circulation pump development. Final report, 6:18357 (DOE/SF/02005—T1)
Joint Publications Research Service, Washington, DC (USA)
China Report: economic affairs, No. 121. Energy: conservation efforts taking hold, new avenues explored, 6:18153 (JPRS—77615)
Jorgenson (Dale W.) Associates, Cambridge, MA (USA)
Industry and economic impacts of restrictions on the growth of generating capacity. Interim report, 6:18764 (EPRI-EA—1775)

K

Kansas Energy Office, Topeka (USA)
Spoil bank energy forest systems. Final report to the Ozarks Regional Commission, 6:17940 (NP—25378)
Kansas State Univ., Manhattan (USA). Dept. of Forestry
Spoil bank energy forest systems. Final report to the Ozarks Regional Commission, 6:17940 (NP—25378)
Kansas Univ., Lawrence (USA). Dept. of Chemistry
Many-body processes in atomic and molecular physics. Progress report, 6:19432 (DOE/ER/10748—1)
Kennedy Van Saun Corp., Danville, PA (USA)
Coal materials handling: classifier evaluation. Quarterly progress report, October-December 1980, 6:17954 (DOE/MC/14266—T3)
KMS Fusion, Inc., Ann Arbor, MI (USA)
Inertial fusion research. Annual technical report, 1979, 6:19541 (DOE/DP/40030—2)
Knolls Atomic Power Lab., Schenectady, NY (USA)
Fission cross section measurement of ^{248}Cm, 6:19483 (CONF-810606—26)
KVB, Inc., Irvine, CA (USA)
Bench-scale study of the dry removal of SO_2 with nahcolite and trona. Final report, 6:17934 (EPRI-CS—1744)

L

Lawler, Matusky and Skelly, Pearl River, NY (USA)
Methodology for assessing population and ecosystem level effects related to intake of cooling waters: methodology application to Cayuga Lake. Final report, 6:18545 (EPRI-EA—1749)
Lawrence Berkeley Lab., CA (USA)
Accelerator and Fusion Research Division annual report, fiscal year 1980, October 1979-September 1980, 6:19136 (LBL—12263)
Catalytic oxidation ofS(IV) on activated carbon in aqueous suspension: kinetics and mechanism, 6:19201 (LBL—12218)
CHART: a graphic display and analysis system, 6:19596 (LBL-PUB—3015)
Comparison of the costs of superconducting accelerator dipoles using NbTi, Nb_3Sn and NbTiTa, 6:19133 (LBL—11744)
Compilation of current high-energy-physics experiments, 6:19443 (LBL—91(Rev.)(4-80))
Effect of nuclear spin on chemical reactions and internal molecular rotation, 6:19035 (LBL—10594)
Energy in the Pacific Coastal Zone: does D.O.E. have a role, 6:18730 (LBL—11154)
Experiments on stochastic cooling of 200 MeV protons, 6:19141 (LBL—11753)
Focusing of heavy-ion beams on a fusion target, 6:19553 (LBL—11745)
Heavy ion beam studies and imaging with a multiplane multiwire proportional chamber, 6:19132 (LBL—11718)
Impact of energy-conserving retrofits on indoor air quality in residental housing, 6:18835 (LBL—12189)
KELVIN rare gas time-of-flight program, 6:19014 (LBL—12422)
LBL Wideroe-based heavy ion injector project, 6:19130 (LBL—11693)
Lignin biodegradation and the production of ethyl alcohol from cellulose, 6:18262 (LBL—12207)
Measurement of in-situ stress in salt and rock using NQR techniques, 6:19400 (LBL—11895)
Mechanism of intragranular migration of brine inclusions in salt, 6:19384 (LBL—12090)
Migration of radionuclides through sorbing media analytical solutions - II, 6:19228 (LBL—11616(Vol.1))
New aspects of buffer-gas effects in resonant spectrophones, 6:19434 (LBL—12367)
Novel epoxy-free construction method for fabricating dipole magnets and test results, 6:19134 (LBL—11752)
Performance of dipole magnets in helium II, 6:19062 (LBL—11754)
Performance of residential air-to-air heat exchangers: test methods and results, 6:18833 (LBL—11793)
Permanent magnet undulator for SPEAR, 6:19109 (LBL—11743)
Power basic and the 9980/9981, 6:19594 (LBL—12235)
Proceedings of the fifth Berkeley conference on distributed data management and computer networks, 6:19621 (LBL—11860)
Prospects for 10T accelerator dipole magnets, 6:19137 (LBL—12456)
Quench protection and design of large high-current-density superconducting magnets, 6:19135 (LBL—12233)
Radiative cooling test facility and performance evaluation of 4-MIL aluminized polyvinyl fluoride and white-paint surfaces, 6:18834 (LBL—12049)
Reaction behavior of zircaloy with simulated fission products, 6:18962 (LBL—12069)
Relationship between cancer incidence and two pollutants (total suspended particulate and carbon monoxide) for the San Francisco bay area, 6:19321 (LBL—10847)
Stochastic cooling of bunched beams, 6:19110 (LBL—11748)
Structure and bonding in organo-lanthanide and -actinide compounds, 6:19044 (LBL—12401)
Study of the beam breakup mode in linear induction accelerators for heavy ions, 6:19108 (LBL—11741)
Susie: a program for analysis of 1 dimensional spectra. Version. 20 Feb 1981, 6:19595 (LBL-PUB—3014)
Symposium commemorating the 25th anniversary of the discovery of mendelevium, 6:19042 (LBL—11599)
Transverse-longitudinal coupling in intense beams, 6:19111 (LBL—11750)
Unique space saving accelerator cavity design, 6:19131 (LBL—11714)
Lawrence Livermore National Lab., CA (USA)
Analysis of multiple gas-solid reactions during the gasification of char in oil-shale blocks, 6:18062 (UCRL—85279)
Application analysis of energy-storage systems for transportation, 6:18933 (UCRL—85851)
Applied chemical kinetics in practical combustion systems, 6:19054 (UCRL—85560)
Calibration of a neutron log in partially saturated media. Part II. Error analysis, 6:19161 (UCRL—85102)
Chemical-decomposition models for the thermal explosion of confined HMX, TATB, RDX, and TNT explosives, 6:19175 (UCRL—84986)
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Double-sided electron-beam generator for KrF laser excitation, 6:19079 (UCID—18635)
Effects of pressure and temperature on the thermal properties of a salt and a quartz monzonite, 6:19406 (UCRL—85285)
Elastic moduli, thermal expansion, and inferred permeability of Climax quartz monzonite and Sudbury gabbro to 500°C and 55 MPa, 6:19407 (UCRL—85736)
Electroforming copper targets for RTNS-II, 6:19568 (UCRL—84922)
Energy and Resource Planning Group FY 1980. Annual report, March 1, 1981, 6:18734 (UCRL—53114)
Energy and technology review, 6:19424 (UCRL—52000-81-4)
Equations of state of $CaCO_3$ and its mixtures with H_2O, 6:19405 (UCRL—53113)
Fission cross section measurement of ^{248}Cm, 6:19483 (CONF-810606—26)
Fundamentals of contamination control technology, 6:19066 (UCID—19022)

Fusion-reactor aspects of the compact torus, 6:19571 (UCRL—85691)
Geomechanics of the Climax mine-by, Nevada Test Site, 6:18087 (UCRL—85768)
Gold and silver in stream sediments from reconnaissance of 3 x 10^5 KM^2 of the western United States, 6:19018 (UCID—19025)
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Hybrid reactors, 6:19567 (UCRL—84826(Rev.1))
Hydrodynamics, megaflops, and multiprocessors, 6:19614 (UCRL—84954)
In situ geomechanics: Climax granite, Nevada Test Site, 6:19404 (UCRL—53076)
In situ oil shale retorting: water quality, 6:18061 (UCID—18986)
Interpolation of detonation parameters from experimental particle-velocity records, 6:19176 (UCRL—84987)
Lawrence Livermore National Laboratory oil shale project. Quarterly report, October-December 1980, 6:18059 (UCID—16986-80-4)
Line shapes for some specific transitions in Hydrogenic, Lithium-like, and Helium-like ions, 6:19525 (UCID—18876)
LLNL explosives handbook: properties of chemical explosives and explosives and explosive simulants, 6:19173 (UCRL—52997)
Material presented to advisory committee on reactor safeguards, subcommittee on extreme external phenomena, January 29-30, 1981, Los Angeles, California. Seismic safety margins research program, 6:18625 (UCID—18955)
Methods and procedures for evaluation of neutron-induced activation cross sections, 6:19504 (UCRL—84847)
Microprocessor-controlled data-acquisition instrument for neutron-activation measurements, 6:19526 (UCRL—85480)
National Uranium Resource Evaluation Program: the Hydrogeochemical Stream Sediment Reconnaissance Program at LLNL, 6:19412 (UCRL—52990)
New concept for a high-repetition-rate reactor for inertial-confinement fusion, 6:19569 (UCRL—85162)
ODE solvers for use with the method of lines, 6:19615 (UCRL—85293(Rev.1))
Oil shale project run summary: small retort run S-19, 6:18060 (UCID—18898)
Physics of short-wavelength-laser design, 6:19080 (UCRL—53100)
Precision machining commercialization, 6:19065 (UCID—17948(Rev.1))
Preliminary design of a Tandem-Mirror-Next-Step facility, 6:19564 (UCRL—53060)
Private sector technology transfer. Final report, 6:18733 (UCRL—15342)
Process for the extraction of heavy metals dissolved in seawater, 6:18082 (UCRL-Trans—11677)
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Reactor systems modeling for ICF hybrids, 6:19566 (UCRL—84229)
RECFIL: software package for recursive digital filtering, 6:19611 (UCID—19021)
Remote sensing of soil radionuclide fluxes in a tropical ecosystem, 6:19230 (UCRL—84501)
Shock initiation of explosives by the impact of small diameter cylindrical projectiles, 6:19178 (UCRL—84998)
SILVA: a model for forecasting the effects of SO_2 pollution on growth and succession in a western coniferous forest, 6:19222 (UCRL—53109)
Sister chromatid exchange, DNA repair, and single-gene mutation, 6:19265 (UCRL—85849)
Summary of TMX results: executive summary, 6:19565 (UCRL—53120(Summ.))
Technology information system review, 6:19622 (UCRL—85853)
Temperature measurement of shocked explosives by time-resolved infrared radiometry: a new technique to measure shock-induced reaction, 6:19177 (UCRL—84989)
Trap with ambipolar plugs, 6:19530 (UCRL-Trans—11670)
Uranium-series dating of pedogenic carbonates from the Livermore Valley, California, 6:19387 (UCRL—53095)

Little (Arthur D.), Inc., Cambridge, MA (USA)
Electric Utility Rate Design Study: load controls and equipment for using off-peak energy, 6:18907 (NP—25324)
Near-term high potential counties for SWECS. Final report, 6:18526 (SERI/TR—98282-11)
Near-term high potential counties for SWECS. Final report, 6:18527 (SERI/TR—98282-11(App.))

Living Systems, Winters, CA (USA)
Suncatcher and cool pool. Project report, 6:18353 (DOE/CS/34153—4)

Lockheed Missiles and Space Co., Sunnyvale, CA (USA)
Development of a pilot-scale kinetic extruder feeder system and test program. 1st quarterly technical progress report, October-December 1980, 6:17955 (DOE/MC/14602—3)

Los Alamos National Lab., NM (USA)
Accelerator Technology Program. Progress report, January-June 1980, 6:19125 (LA—8736-PR)
Applied nuclear data research and development. Progress report, October 1-December 31, 1980, 6:19484 (LA—8757-PR)
Compact-Toroid fusion reactor based on the field-reversed theta pinch, 6:19551 (LA—8758-MS)
COVFILS: 30-group covariance library based on ENDF/B-V, 6:19462 (LA—8733-MS)
Customized explosives based on plastic-bonded mixtures of TATB and HMX, 6:19168 (LA-UR—81-872)
Earthquake catalog for northern New Mexico. Progress report, October 1980-December 1980, 6:19391 (LA—8745-PR)
Effect of anisotropy in explosive fragmentation, 6:19398 (LA-UR—81-887)
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Experimentally determined rock-fluid interactions applicable to a natural hot-dry-rock geothermal system, 6:18521 (LA-UR—81-534)
Explosively produced fracture of oil shale. Progress report, April-June 1980, 6:18052 (LA—8553-PR)
Fine structure in nitromethane/acetone detonations, 6:19164 (LA-UR—81-704)
Genotoxic effects of sunlight-activated waste waters, 6:19320 (LA-UR—81-986)
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Improvement of the sensitivity of opto-acoustic trace gas analysis by condensation, 6:19200 (LA-UR—81-800)
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New scintillators for fiber optics: system sensitivity and bandwidth as a function of fiber length, 6:19153 (LA-UR—81-171)
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Nuclear Safeguards Research and Development. Program status report, July-September 1980, 6:18121 (LA—8590-PR)
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One-dimensional model of the dynamic layer behavior in a salt-gradient solar pond, 6:18359 (LA-UR—81-987)
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PIGMI: a pion generator for medical irradiations, 6:19129 (LASL—81-6(Mini-Review))
Progress at LAMPF: Clinton P. Anderson Meson Physics Facility. Progress report, July-December 1980, 6:19126 (LA—8768-PR)
Shock initiation of porous TATB, 6:19167 (LA-UR—81-871)
Small-signal gain spectrum of an 1800-torr CO_2 amplifier, 6:19077 (LA-UR—81-0020)
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Superconducting magnetic energy storage (SMES) program. Progress report, January 1-December 31, 1980, 6:18706 (LA—8777-PR)
Suppression of ignition by interface instabilities in small fusion targets, 6:19552 (LA-UR—81-433)
Test and evaluation results of the ^{252}Cf shuffler at the Savannah River Plant, 6:19013 (LA—8755-MS)

Testing and evaluation of the US Navy supplied-air suit, 6:19060 (LA—8727-MS)
Thermal hazards of explosives, 6:19170 (LASL—81-9)
Thermal storage wall model development in the DOE-2 computer program, 6:18492 (LA-UR—81-981)
Thermochemical processes for hydrogen production. Progress report, October 1, 1979-September 30, 1980, 6:18142 (LA—8675-PR)
User's manual for a process model code, 6:18122 (LA—8761-M)
Validation experiences with a nonlinear shell-of-revolution in ADINA and NONSAP, 6:19593 (LA-UR—80-2422)

Los Alamos Scientific Lab., NM (USA)
Application of fluid-chemistry studies to a hot-dry-rock geothermal system: I. Neutron-activation studies, 6:18501 (LA—8766-MS)
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Assessment and control of water contamination associated with shale oil extraction and processing. Progress report, October 1, 1978-September 30, 1979, 6:18067 (LA—8506-PR)
Biotelemetry studies on elk, 6:19221 (LA—8529-NERP)
Coal-gasification instrumentation program (PR 11734). Quarterly progress report, January 1, 1981-March 31, 1981, 6:17920 (DOE/TIC—11447)
Comparison of methods for calculation of recommended elemental concentrations for Canadian Certified Reference Materials Project rock standards SY-2, SY-3, and MRG-1, 6:19397 (LA—8770-MS)
Computing Division two-year operational plan, FY 1981-1982, 6:19592 (LA—8725-MS)
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Solar energy research at Los Alamos. Progress report, April 1, 1980-September 30, 1980, 6:18439 (LA—8782-PR)
Space nuclear safety and fuels program. Progress report, January 1981, 6:18138 (LA—8824-PR)
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Tokamak poloidal field systems. Progress report, January 1-December 31, 1980, 6:19550 (LA—8740-PR)
Unusual capabilities and new programs, 6:19182 (LA-UR—81-1016)

Los Angeles City Bureau of Engineering, CA (USA)
Cogeneration feasibility study for City of Los Angeles, civic center municipal buildings: City Hall, City Hall East, City Hall South, Parker Center. Consultant report, 6:18908 (P—500-80-037)

Los Angeles, City of, CA (USA)
Decision process for the retrofit of municipal buildings with solar energy systems: a technical guide, 6:18355 (DOE/IR/05106—2)

Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (USA)
Characterization of an aerosol sample from Three Mile Island Reactor auxiliary building, 6:18616 (LMF—70)
Inhalation Toxicology Research Institute. Annual report, October 1, 1979-September 30, 1980, 6:19280 (LMF—84)

M

Main (Charles T.), Inc., Boston, MA (USA)
Electric Utility Rate Design Study: the accounting-cost basis for evaluating block rates, 6:18769 (NP—25323)
Half Moon Cove Tidal Project. Feasibility report, 6:18523 (DOE/ID/12089—T1)

Manlabs, Inc., Cambridge, MA (USA)
EXAFS studies of the local atomic environment in metal-metal glasses, 6:18956 (CONF-8006158—2)

Market Facts, Inc., Washington, DC (USA)
Energy-efficient electric motors study, 6:18898 (DOE/CS/40265—T1)

Mason and Hanger-Silas Mason Co., Inc., Amarillo, TX (USA)
Diametric disc and standard tensile-test correlation study. Process development endeavor No. 209, 6:19172 (MHSMP—81-22)
Environmental monitoring report for Pantex Plant covering 1980, 6:19216 (MHSMP—81-18)
Preliminary evaluation of HMX explosives with Kraton G binder, 6:19171 (MHSMP—81-17)

Massachusetts Inst. of Tech., Cambridge (USA)
Two-fluid modeling of two-phase flow in BWR cores, 6:18581 (SAND—81-0067C)

Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.
Analysis and test of line-commutated inverters for use in residential photovoltaic power systems, 6:18304 (DOE/ET/20279—127)

Massachusetts Inst. of Tech., Oak Ridge, TN (USA). School of Chemical Engineering Practice
Use of extractive distillation to produce concentrated nitric acid, 6:18094 (ORNL/MIT—325)

Maurer Engineering, Inc., Houston, TX (USA)
State-of-the-art of drilling thrusters, 6:18514 (SAND—79-7129)

McCray (James), Madison, WI (USA)
Low cost process heat recovery. Interim report, 6:18899 (DOE/R5/10251—1)

McMillan and Associates, San Francisco, CA (USA)
Home Energy Management Devices. Final report, 6:18831 (DOE/SF/01983—T1)

Michigan State Univ., East Lansing (USA)
Nucleon-nucleon theory and phenomenology, 6:19440 (DOE/ER/10516—8)
Nucleon-nucleon theory and phenomenology. Progress report and renewal proposal, June 1, 1981-May 31, 1982, 6:19441 (DOE/ET/10516—9)
Updating scientific information through key publications, 6:19620 (DOE/ER/10516—T8)

Michigan State Univ., East Lansing (USA). Dept. of Physics
Data management design: nucleon-nucleon data bank (0 to 1200 MeV), 6:19589 (DOE/ER/10516—6)

Michigan Univ., Ann Arbor (USA)
Design and test results of a pulsed quadrupole magnet with a 2 μs rise time, 6:19118 (BNL—29317)

Michigan Univ., Ann Arbor (USA). Architectural Research Lab.
Solarization/conservation technology development program for existing housing. Progress report, 6:18828 (DOE/R5/10227—1)

Miller (Donald R.), Roseau, MN (USA)
Air medium solar heating system. Final report, 6:18436 (DOE/R5/10136—2)
Motorola, Inc., Phoenix, AZ (USA)
Thin-film polycrystalline silicon solar cells. Final technical report, 1 October 1979-30 September 1980, 6:18279 (SERI/TR—8277-1-T2)
Motorola, Inc., Phoenix, AZ (USA). Semiconductor Group
Establishment of a production-ready manufacturing process utilizing thin silicon substrates for solar cells. Final report. Motorola report No. 2364/4, 6:18259 (DOE/JPL/955328—80/4)
Mound Facility, Miamisburg, OH (USA)
Electron and photon interactions with $KClO_4$, 6:19040 (MLM—2806(OP))
GRPNL2: an automated program for fitting gamma and x-ray peak multiplets, 6:19460 (MLM—2807)
Potable water standards project. Final report, 6:19238 (MLM—2819)
Test and evaluation of an Argonne National Laboratory small sample calorimeter, 6:19157 (MLM—2813)
Mueller Associates, Inc., Baltimore, MD (USA)
Economic analysis of commercial solar water-heating systems, 6:18342 (ANL-K—80-55)

N

National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center
Burner-rig evaluation of thermal barrier coating systems for nickel-base alloys, 6:18959 (DOE/NASA/2593—26)
Electric vehicle motors and controllers, 6:18931 (DOE/NASA/51044—18)
High power densities from high-temperature material interactions, 6:18807 (DOE/NASA/1062—7)
Thermionic energy conversion (TEC) topping thermoelectrics, 6:18538 (DOE/NASA/1062—8)
National Aeronautics and Space Administration, Huntsville, AL (USA). George C. Marshall Space Flight Center
Solar space and water heating system installed at Charlottesville, Virginia, 6:18356 (DOE/NASA/CR—161675)
National Conference of State Legislatures, Denver, CO (USA)
State government workshop on barriers and incentives of geothermal energy resources. Quarterly report, November 1, 1978-January 31, 1979, 6:18503 (DOE/SF/01795—T1)
National Transportation Safety Board, Washington, DC (USA). Bureau of Accident Investigation
Pipeline accident report: Municipal Gas Department of Cordele, Georgia, explosion and fire, Cordele, Georgia, February 21, 1980, 6:18050 (NTSB-PAR—80-5)
National Transportation Safety Board, Washington, DC (USA). Bureau of Technology
Analysis of accident data from plastic pipe natural gas distribution systems. Special study, 6:18051 (NTSB-PSS—80-1)
Naval Ocean Research and Development Activity, Bay Saint Louis, MS (USA)
Effect of microfouling on heat-transfer efficiency, 6:18340 (DOE/CH/10030—1)
Naval Research Lab., Washington, DC (USA)
Calculations of Brillouin backscatter in laser-produced plasmas, 6:19556 (NRL-MR—4503)
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Fully two-dimensional equilibrium and transport model of the poloidal divertor, 6:19554 (NRL-MR—4498)
Numerical simulation of tokamak electron dynamics, 6:19520 (NRL-MR—4504)
Numerical study of the nanosecond and subnanosecond performance of GEKKO XII-Module, 6:19078 (NRL-MR—4493)
Simulation of laser beam nonuniformity effects, 6:19555 (NRL-MR—4500)
Naval Weapons Center, China Lake, CA (USA). Michelson Labs.
Preparation and characterization of hydrogenated amorphous silicon. Quarterly progress report No. 6, 1 September-30 November 1980, 6:18272 (SERI/PR—8142-4-T1)
New Mexico State Univ., Las Cruces (USA). New Mexico Energy Inst.
Comprehensive planning for the development of geothermal energy in Las Cruces and Dona Ana County, New Mexico. Final report, January 1-December 3, 1980, 6:18498 (NP—25367)
New Mexico Univ., Albuquerque (USA). Technology Application Center
Solar thermal heating and cooling: a bibliography with abstracts. Quarterly report, October-December 1980, 6:18376 (TAC-STHC—80-004)
New York Univ., NY (USA). Inst. of Environmental Medicine
In vivo measurements of bone-seeking radionuclides. Progress report, 1977-1980, 6:19145 (DOE/EV/04326—3)
New York Univ., Westbury, NY (USA). Antonio Ferri Labs.
Experimental investigation of fuel vaporization on combustion efficiency, 6:18836 (NYU/DAS—78-25)
North Carolina Univ., Chapel Hill (USA). Dept. of Botany
Rates of biomass accumulation of North Carolina Piedmont forests, 6:18263 (NCEI—0029)
Northwestern Univ., Evanston, IL (USA)
Properties of supported metal catalysts. Progress report, 1 Apr 1980-1 March 1981, 6:19022 (DOE/ER/04254—4)
Notre Dame Univ., IN (USA). Radiation Lab.
Catalog of data compilations on photochemical and photophysical processes in solution, 6:19036 (NBS-SPEC.PUBL.—578)

O

Oak Ridge Associated Universities, Inc., TN (USA)
Acceptable future nuclear energy system. Gatlinburg II condensed workshop proceedings, December 10-12, 1979, Gatlinburg, Tennessee, 6:18570 (ORAU/IEA—80-3(P))
PREG: a computer program for Poisson regression analysis, 6:19598 (ORAU—178)
Training and technology statistical report, October 1979-September 1980, 6:19587 (ORAU—176A)
Oak Ridge Gaseous Diffusion Plant, TN (USA)
Cover-gas and air buoyancy correction for the gravimetric analysis of uranium in uranium hexafluoride, 6:19011 (K/TL/AT—40)
Oak Ridge National Lab., TN (USA)
Applications of laser annealing and laser-induced diffusion to photovoltaic conversion, 6:18254 (CONF-810349—1)
Chemicals for enhanced oil recovery. Biennial report, April 1978-March 1980, 6:18027 (DOE/BETC/OR—11)
Computer graphics at Oak Ridge National Laboratory: some observations based on experience, 6:19588 (CONF-810440—1)
Development of a packed-bed letdown valve for coal-liquefaction plants, Part 2, 6:17925 (ORNL/MIT—328)
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Disintegration and size reduction of slags and metals after melt refining of contaminated metallic wastes, 6:18095 (ORNL/TM—7671)
DOMINO-II, a general purpose code for coupling DOT-IV discrete ordinates and Monte Carlo radiation transport calculations, 6:19602 (ORNL/TM—7771)
Equilibrium evolution on the resistive time scale in a tokamak reactor, 6:19521 (ORNL/TM—7678)
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Fission cross section measurement of ^{248}Cm, 6:19483 (CONF-810606—26)
Fossil energy program. Progress report for January 1981, 6:17908 (ORNL/TM—7723)
Fossil energy program. Quarterly progress report for period ending December 31, 1980, 6:17907 (ORNL—5727)
Guide to proofing QUME-formatted TEDI files on the ORNL FED versatec printer/plotters, 6:19600 (ORNL/TM—7587)
Iso-response contours in the ETF neutral-beam injectors, 6:19558 (ORNL/TM—7783)
Management of quality-assurance controls: decision support systems, 6:19619 (CONF-810227—3)

Melting phenomenon and laser annealing in semiconductors, 6:19001 (CONF-810446—1(Draft))
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PURPA and associated technical issues, 6:18745 (CONF-810444—1)
Return on your metrication investment: a case study, 6:19586 (CONF-810449—1)
Software enhancement to produce report-quality graphics from gifts, 6:19601 (ORNL/TM—7666)
Some extensions of an algorithm for sparse linear least squares problems, 6:19599 (ORNL/CSD—80)
Studies of defects and solubility limits in SPE grown in- and Sb-implanted silicon, 6:19003 (CONF-810446—3(Draft))
TEM studies of defects in laser annealed gallium arsenide, 6:19002 (CONF-810446—2(Draft))
TPASS: a gamma-ray spectrum analysis and isotope identification computer code, 6:19461 (ORNL—5732)
Use of extractive distillation to produce concentrated nitric acid, 6:18094 (ORNL/MIT—325)

Oak Ridge Y-12 Plant, TN (USA)
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Oak Ridge Flywheel Evaluation Laboratory test report on the Garrett AiResearch Flywheel, 6:18707 (Y/DX—227)
Precision machining commercialization, 6:19065 (UCID—17948(Rev.1))
X-ray fluorescence analysis of various alloys. Part 1, 6:18967 (Y/DK—246)

Ohio State Univ., Columbus (USA). Dept. of Physics
Neutrino mixing in SO(10)*, 6:19450 (DOE/ER/01545—298)

Oregon State Univ., Corvallis (USA). Dept. of Atmospheric Science
Analysis of strong nocturnal shears for wind machine design. Final report, 6:18529 (DOE/ET/23116—80/1)

Oregon State Univ., Corvallis (USA). Dept. of Chemical Engineering
Scaled-bed modeling for fluidized-bed combustors. Semi-annual report, October 1, 1980-March 31, 1981, 6:18539 (DOE/PC/30218—T1)

Oregon State Univ., Corvallis (USA). School of Oceanography
Cycling of transuranic radionuclides in the Columbia River, its estuary and the northeast Pacific ocean. Progress report, February 1980-February 1981, 6:19237 (DOE/EV/70030—4)

P

Payne, Inc., Annapolis, MD (USA)
Experiments with structural concrete blocks which double as solar air heaters. Final report, 6:18352 (DOE/CS/34138—T1)

Pease (J.N.) Associates, Charlotte, NC (USA)
Passive solar commercial buildings: design assistance and demonstration program. Phase 1. Final report, 6:18346 (DOE/CS/30329—T1)

Pennsylvania Dept. of Environmental Resources, Harrisburg (USA). Bureau of Topographic and Geologic Survey
Stratigraphic cross section (B) of the Upper Devonian Perrysburg and Java Formations and their equivalents, Northwestern Pennsylvania, 6:18042 (METC/EGSP—15)
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Stratigraphic cross section (J) of the Upper Devonian Perrysburg and Java Formations and their equivalents, Northwestern Pennsylvania, 6:18046 (METC/EGSP—23)

Pennsylvania State Univ., University Park (USA)
Atom-probe field-ion-microscopy study of Fe-Ti alloys, 6:18955 (CONF-800544—3)
Computer modeling of theta-pinch behavior with plasma-column rotation, 6:19516 (DOE/ET/53018—5)
Investigation of the distribution of minerals in coals by normative analysis, 6:17933 (FE—2494-TR-2)

Pennsylvania State Univ., University Park (USA). Coal Research Section
Some aspects of the mechanism and kinetics of coal liquefaction, 6:17921 (FE—2494-TR-3)

Pennsylvania State Univ., University Park (USA). Dept. of Materials Science and Engineering
Gas-phase carbon formation rates and mechanisms under high-temperature hydrocarbon reforming conditions. Annual project status and technical progress report, September 28, 1979-September 30, 1980, 6:19052 (PSU-FCL-C—80-87)

Pennsylvania State Univ., University Park (USA). Materials Research Labs.
Characterization of samples of a cement-borehole plug in bedded evaporites, 6:18093 (ONWI—70)
Structure of glasses containing transition metal ions. Progress report, February 1, 1980-January 31, 1981, 6:19004 (DOE/ER/02754—T1)

Pennsylvania Univ., Philadelphia (USA)
Thermochemical processes for hydrogen production by water decomposition. Final report, 6:18140 (DOE/ER/02747—T1)

Pennsylvania Univ., Philadelphia (USA). National Center for Energy Management and Power
Convergence measurements for squeeze monitoring: instrumentation and results. Bureau of Mines technical progress report 113, 6:17947 (BM-TPR—113)

Pfister Bros. Farms, Grabill, IN (USA)
Power Alcohol Plant, Pfister Bros. Farms. Technical progress report, 6:18146 (DOE/AF/92011—1)

Physical Sciences, Inc., Woburn, MA (USA)
Empirical systems model of the Westinghouse fluidized-bed PDU coal gasifier. Task report No. 1, 6:17913 (DOE/MC/14361—T1)
Modeling of wet-gas cleanup: Task 13. Final technical report. Volume II: code documentation, 6:17912 (DOE/MC/08450—T1(Vol.2))
Soot control for fuel-cell anodes: task No. 16. Final topical report, July 1, 1980-September 30, 1980, 6:18809 (DOE/MC/08450—T2)

Power Technologies, Inc., Schenectady, NY (USA)
Pool daily fuel scheduling. Volume 3: Program listings. Final report, February 1981, 6:18767 (EPRI-EL—1659(Vol.3))
Pool daily fuel scheduling. Volume 2: programming manual. Final report, February 1981, 6:18766 (EPRI-EL—1659(Vol.2))
Pool daily fuel scheduling. Volume 1: technical manual. Final Report, February 1981, 6:18765 (EPRI-EL—1659(Vol.1))

Pratt and Whitney Aircraft, East Hartford, CT (USA). Commercial Products Div.
Combustor liner durability analysis, 6:18916 (NASA-CR—165250)

Princeton Univ., NJ (USA)
Applied chemical kinetics in practical combustion systems, 6:19054 (UCRL—85560)

Princeton Univ., NJ (USA). Dept. of Chemical Engineering
Short residence time hydropyrolysis of coal. Technical progress report, 1 July-31 September 1980, 6:17911 (DOE/ET/13153—T4)

Princeton Univ., NJ (USA). Dept. of Chemistry
Progress report, December 1, 1979-November 30, 1980, 6:19023 (DOE/ER/04341—5)

Princeton Univ., NJ (USA). Plasma Physics Lab.
Calculation of the statistical properties of strange attractors, 6:19523 (PPPL—1764)
Narrow H-alpha emission profiles in tokamaks: molecular origin and observational effects, 6:19522 (PPPL—1758)
New techniques for calculating heat and particle source rates due to neutral-beam injection in axisymmetric tokamaks, 6:19559 (PPPL—1753)
Plasma heating with multi-MeV neutral impurity beams, 6:19560 (PPPL—1759)

Public Technology, Inc., Washington, DC (USA)
Columbus moves to develop low-head hydro potential, 6:18193 (DOE/IR/05106—T38)
Columbus refuse/coal fired generating plant, 6:18537 (DOE/IR/05106—T40)
Decision process for the retrofit of municipal buildings with solar energy systems: a technical guide, 6:18355 (DOE/IR/05106—2)

Purdue Univ., Lafayette, IN (USA). Dept. of Chemistry
Flash photoelectrochemical studies of transient electrode processes important in solar energy conversion. Progress report, May 1, 1980-April 30, 1981, 6:18256 (DOE/ER/04263—4)

Purdue Univ., Lafayette, IN (USA). School of Mechanical Engineering
Measurement of radical-species concentrations and polycyclic aromatic hydrocarbons in flames by fluorescence and absorption using a tunable dye laser. Progress report, March 1, 1980-February 28, 1981, 6:19049 (DOE/ER/04939—T1)
Proceedings of the conference on waste heat recovery for energy conservation: residential and light commercial heat pumps, air conditioning, and refrigeration systems, 6:18822 (CONF-800966—)

R

R and D Associates, Marina del Rey, CA (USA)
Free-free gaunt factors for gold plasmas at laser-fusion conditions, 6:19563 (UCRL—15328)

Rensselaer Polytechnic Inst., Troy, NY (USA)
Fission cross section measurement of ^{248}Cm, 6:19483 (CONF-810606—26)

Research Triangle Inst., Research Triangle Park, NC (USA)
Development of high-efficiency, low-cost $ZnSiAst_2$ solar cells. Final report, April 9, 1979-June 8, 1980, 6:18258 (DOE/ET/23001—T6)
Symposium proceedings: environmental aspects of fuel conversion technology, IV (April 1979, Hollywood, FL), 6:17939 (EPA/600/7—79-217)

Rhode Island Univ., Kingston (USA)
Competitive economics of nuclear power, 6:18595 (DOE/ET/33025—1)

Rockwell International Corp., Anaheim, CA (USA). Microelectronics Research and Development Center
Chemical vapor deposition of thin-film polycrystalline Si for low-cost solar cells. Final technical report, July 23, 1979-July 22, 1980, 6:18260 (DOE/SF/23045—4)

Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group
Radiation and transmutation effects relevant to solid nuclear waste forms, 6:18090 (DOE/ET/41900—4)
Solar repowering system for Texas Electric Service Company Permian Basin Steam Electric Station Unit No. 5. Final report, executive summary, 6:18314 (DOE/SF/10607—T1)

Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant
Calorimetry end-point predictions, 6:19015 (RFP—2914)
Extraction behavior of americium and plutonium with mixed-solvent extractions, 6:19016 (RFP—3187)

Rockwell International Corp., Richland, WA (USA). Energy Systems Group
Full-scale heater tests No. 1 and No. 2 at the Near-Surface Test Facility: preliminary results, 6:18099 (RHO-BWI-LD—34)
Long-term high-level defense waste technology. Progress report, October-December 1980, 6:18101 (RHO-LD—81-101-A)

Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations
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Sorption of trace cesium on 21 Hanford Site sediment types, 6:19229 (RHO-SA—214)

Rockwell International Corp., Thousand Oaks, CA (USA). Science Center
Acoustic emission signature analysis. Technical progress report No. 2, 1 March 1979-29 February 1980, 6:18958 (DOE/ER/02029—T1)

Ross (James W.), Scottsdale, AZ (USA)
Home Energy Management Devices. Final report, 6:18831 (DOE/SF/01983—T1)

S

Sandia National Labs., Albuquerque, NM (USA)
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Proceedings of a workshop on physical oceanography related to the subseabed disposal of high-level nuclear waste, 6:19414 (SAND—80-1776)
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Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 2 of 2, 6:18104 (SAND—80-2577(Vol.2)(Pt.2))
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User/programmer guide for UCMD 49 thick-film resistor layout, 6:19089 (SAND—81-0400)

Sandia National Labs., Livermore, CA (USA)
Design, cost, and performance comparisons of several solar thermal systems for process heat. Volume III. Receivers, 6:18441 (SAND—79-8281)
Design, cost and performance comparisons of several solar thermal systems for process heat. Volume V. Systems, 6:18443 (SAND—79-8283)
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Saskatchewan Univ., Saskatoon (Canada). Dept. of Mechanical Engineering
Energy efficient housing: a prairie approach, 6:18824 (CONF-7910212—)

Science Applications, Inc., Albuquerque, NM (USA)
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Science Applications, Inc., La Jolla, CA (USA)
Consumer-products minimum-energy-efficiency standards program. Monthly progress report, 1 October-31 October 1980, 6:18841 (SAI—444-80-606-LJ)

Science Applications, Inc., San Diego, CA (USA)
High efficiency particulate removal with sintered metal filters, 6:19196 (CONF-810319—2)

Science Applications, Inc., San Leandro, CA (USA)
Cumulative-strain-damage model of ductile fracture: simulation and prediction of engineering fracture tests, 6:18966 (UCRL—53058)

Simplec Manufacturing Co., Inc., Dallas, TX (USA)
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Society of Petroleum Engineers (AIME), Dallas, TX (USA)
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Qualifier
Title, (supplementary information), citation number, (report number)

The title may be supplemented with additional words, or a phrase, if it appears additional information would be helpful. In cases for which the title contains little or no information related to the subject entry, it may be replaced entirely by the supplementary information. A qualifier is not always required, and in such cases the title will follow the unqualified subject descriptor.

The descriptors selected for use as subject terms are generally the names of specific materials, things, or processes. To the extent possible, a qualifier is selected to describe the properties of, or processses applied to, the subject term.

Index entries are selected to indicate the important ideas and concepts presented in a document, rather than words that may appear in the text. Within the available thesaurus terms, the most probable or logical place to look for typical information is selected. "See references" are included to guide users from synonymous terms or phrases to the descriptor selected as a subject heading for the concept. (e.g. Pipeline Quality Gas see HIGH BTU GAS). "See also references" are used to indicate where to find references to subject concepts that are narrower, broader, or related to a particular subject heading. To complete an exhaustive search of a given subject, all such headings should be reviewed.

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AC02-76EV03425	**Fraunhofer-Gesellschaft zur Foerderung der Angewandten Forschung e.V., Garmisch-Partenkirchen (Germany, F.R.). Inst. fuer Atmosphaerische Umweltforschung**	
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AC02-77CH00178	**Solar Energy Research Inst., Golden, CO (USA)**	
	6:18242	SERI/TP—644-1160
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AC02-77CS20076	**Advanced Mechanical Technology, Inc., Newton, MA (USA)**	
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AC02-77ET35202	**General Electric Co., Sunnyvale, CA (USA). Advanced Reactor Systems Dept.**	
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AC02-77EV04326	**New York Univ., NY (USA). Inst. of Environmental Medicine**	
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AC02-79CS30242	**South Dakota Univ., Vermillion (USA)**	
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AC02-79ER10382	**General Electric Co., Schenectady, NY (USA). Corporate Research and Development Dept.**	
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AC02-79ER10430	**Pennsylvania State Univ., University Park (USA)**	
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AC02-79ER10481	**Rensselaer Polytechnic Inst., Troy, NY (USA)**	
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AC02-79ER10516	**Michigan State Univ., East Lansing (USA)**	
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AC02-79ET34020	**Babcock and Wilcox Co., Lynchburg, VA (USA)**	
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AC02-80CS30254	**Texas Univ., Austin (USA). School of Architecture**	
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AC02-80ER10722	**Colorado Univ., Boulder (USA). Dept. of Chemistry**	
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AC02-80ER10748	**Kansas Univ., Lawrence (USA). Dept. of Chemistry**	
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AC02-80ER10755	**Wisconsin Univ., Madison (USA)**	
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AC02-80ET44207	**Burns and Roe Industrial Services Corp., Paramus, NJ (USA)**	
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AC03-76CS51213	**AiResearch Mfg. Co., Los Angeles, CA (USA)**	
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AC03-76CS51294	**General Electric Co., Schenectady, NY (USA). Corporate Research and Development Dept.**	
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AC03-76ER00511	**Hawaii Univ., Honolulu (USA). Dept. of Physics and Astronomy**	
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AC03-76ET12056	**Stanford Univ., CA (USA). Petroleum Research Inst.**	
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AC03-76SF00012	**California Univ., Los Angeles (USA). Lab. of Biomedical and Environmental Sciences**	
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AC03-76SF00515	**Stanford Linear Accelerator Center, CA (USA)**	
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AC03-77CS34495	**Institute of Gas Technology, Chicago, IL (USA)**	
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AC03-79CS10757	**Science Applications, Inc., La Jolla, CA (USA)**	
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AC03-79ET23045	**Rockwell International Corp., Anaheim, CA (USA). Microelectronics Research and Development Center**	
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AC03-79SF10538	**Galaxy, Inc., Washington, DC (USA)**	
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AC04-76DP00789	**Sandia National Labs., Albuquerque, NM (USA)**	
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AC04-76DP03533	**Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant**	
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AC04-76EV01013	**Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (USA)**	
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AC05-78ET20058	**Aerospace Research Corp., Roanoke, VA (USA)**	
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AC06-RL01830	**Battelle Pacific Northwest Labs., Richland, WA (USA)**	
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AC07-76ID01570	**Idaho National Engineering Lab., Idaho Falls (USA)**	
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AC08-78DP40030	**KMS Fusion, Inc., Ann Arbor, MI (USA)**	
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AC09-76SR00001	**Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.**	
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AC09-79ET41900	**Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group**	
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AC13-76GJ01664	**Adams (Samuel S.) and Associates, Boulder, CO (USA)**	
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AC14-76FF02170	**Hanford Engineering Development Lab., Richland, WA (USA)**	
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AC21-76ET12130	**West Virginia Geological and Economic Survey, Morgantown (USA)**	
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AC21-78ET12307	**Curtiss-Wright Corp., Wood-Ridge, NJ (USA). Power Systems Div.**	
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AC21-78MC08385	**Columbia Gas System Service Corp., Columbus, OH (USA)**	
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AC21-79ET15490	**General Electric Co., Schenectady, NY (USA). Energy Systems Programs Dept.**	
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AC21-79MC11577	**SRI International, Menlo Park, CA (USA)**	
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AC21-79MC12736	**Pennsylvania State Univ., University Park (USA). Dept. of Materials Science and Engineering**	
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AC21-80MC14266	**Kennedy Van Saun Corp., Danville, PA (USA)**	
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AC21-80MC14361	**Physical Sciences, Inc., Woburn, MA (USA)**	
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AC21-80MC14602	**Lockheed Missiles and Space Co., Sunnyvale, CA (USA)**	
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AC22-76ET10587	**Pennsylvania State Univ., University Park (USA). Coal Research Section**	
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AC22-77ET10559	**West Virginia Univ., Morgantown (USA). Coal Research Bureau**	
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AC22-77ET11283	**New York Univ., Westbury, NY (USA). Antonio Ferri Labs.**	
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AC22-79ET13397	**Auburn Univ., AL (USA). Coal Conversion Lab.**	
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AC22-80PC30041	**Virginia Polytechnic Inst. and State Univ., Blacksburg (USA)**	
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AC22-80PC30055	**Virginia Commonwealth Univ., Richmond (USA). Dept. of Chemistry**	
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AC22-80PC30117	**Woodward-Clyde Consultants, San Francisco, CA (USA)**	
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AC22-80PC30198	**Hercules, Inc., Cumberland, MD (USA). Allegany Ballistics Lab.**	
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AC22-80PC30252	**Duquesne Univ., Pittsburgh, PA (USA). Dept. of Chemistry**	
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AC22-80PC30296	**Acurex Corp., Mountain View, CA (USA). Energy and Environmental Div.**	
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AC22-80PC30297	**Energy and Environmental Research Corp., Santa Ana, CA (USA)**	
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AC22-80PC30301	**Battelle Columbus Labs., OH (USA)**	
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AC97-79ET44614	**Texas Univ., Austin (USA). Bureau of Economic Geology**	
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AI01-76ET28382	**Naval Research Lab., Washington, DC (USA)**	
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AI01-77ET10350	**National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center**	
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AI01-77ET13111	**National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center**	
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AI02-79CH10030	**Naval Ocean Research and Development Activity, Bay Saint Louis, MS (USA)**	
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AI08-78ET44802	**Geological Survey, Denver, CO (USA)**	
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AM21-78MC08450	**Physical Sciences, Inc., Woburn, MA (USA)**	
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AS02-76ER02747	**Pennsylvania Univ., Philadelphia (USA)**	
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AS02-76ER02754	**Pennsylvania State Univ., University Park (USA). Materials Research Labs.**	
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AS02-76ET53006	**Johns Hopkins Univ., Baltimore, MD (USA)**	
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AS02-77ER04254	**Northwestern Univ., Evanston, IL (USA)**	
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AS02-77ET53007	**Yale Univ., New Haven, CT (USA). Dept. of Engineering and Applied Science**	
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AS02-78ER04939	**Purdue Univ., Lafayette, IN (USA). School of Mechanical Engineering**	
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AS02-78ER14953	**Illinois Inst. of Tech., Chicago (USA). Dept. of Chemistry**	
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AS02-78ET28416	**Delaware Geological Survey, Newark (USA)**	
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AS02-78RA04934	**Franklin Pierce Law Center, Concord, NH (USA). Energy Law Inst.**	
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AS04-76ER03580	**Stanford Univ., CA (USA). Center for Materials Research**	
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AS05-77OR05466	**Texas Univ., Austin (USA). Bureau of Economic Geology**	
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AS05-78ER06030	**Georgia Inst. of Tech., Atlanta (USA). Research Inst.**	
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AS05-78ER06042	**Texas A and M Univ., College Station (USA). Dept. of Chemistry**	
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AS05-79ER10512	**Tennessee Univ., Knoxville (USA). Dept. of Physics**	
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AS05-80ER10565	**Texas A and M Univ., College Station (USA). Cyclotron Inst.**	
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AS05-80ER10638	**Texas Univ., Austin (USA)**	
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AS09-76EV00890	**Georgia Inst. of Tech., Atlanta (USA)**	
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AS21-76MC05198	Pennsylvania Dept. of Environmental Resources, Harrisburg (USA). Bureau of Topographic and Geologic Survey	
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1	6:18576	*See* ORNL-tr-4736
CONF-771231-		(4. workshop on entrainment and impingement, Chicago, IL, USA, 5-7 Dec 1977)
	6:19374	Melville, NY; EA Communications (1978).
CONF-780305-		(American Chemical Society conference, Anaheim, CA, USA, 12-17 Mar 1978)
P7	6:19027	Washington, DC; American Chemical Society (1979).
CONF-780342-		(Meeting on fuel element modeling, Blackpool, UK, 13-17 Mar 1978)
	6:18583	Nucl. Eng. Des., 56: No. 1, 233-256(Feb 1980)
CONF-7805221-		(Lignin biodegradation: microbiology, chemistry, and potential applications seminar, Madison, WI, USA, 9-11 May 1978)
1	6:18262	*See* LBL-12207
(Vol.1)	6:18299	Boca Raton, FL; CRC Press, Inc. (1980).
(Vol.2)	6:18298	Boca Raton, FL; CRC Press, Inc. (1980).
CONF-780788-		(9. international symposium on high energy multiparticle dynamics, Tabor, Czechoslovakia, 2-7 Jul 1978)
	6:19448	*See* INIS-mf-5797
	6:19449	*See* INIS-mf-5797

Report No.	Abstract No.	Availability
CONF-7810191-	(28. Canadian chemical engineering conference, Halifax, Canada, 22-25 Oct 1978)	
	6:17950	NTIS (US Sales Only), PC A09/MF A01
CONF-790443-	(American power conference, Chicago, IL, USA, 23-25 Apr 1979)	
	6:18584	Proc. Am. Power Conf., 41: 121-138(1979)
	6:18587	Proc. Am. Power Conf., 41: 259-265(1979)
	6:18805	Proc. Am. Power Conf., 41: 518-527(23 Apr 1979)
CONF-790449-	(EPA fuel conversion symposium, Hollywood, FL, USA, 17-20 Apr 1979)	
	6:17939	*See* EPA/600/7-79-217
	6:17968	*See* EPA/600/7-79-217
	6:18749	*See* EPA/600/7-79-217
CONF-7906141-	(Topical meeting on the Meson Theory of Nuclear Forces, Bad Honnef, F.R. Germany, 12-14 Jun 1979)	
	6:19500	Mannheim, Germany, F.R.; Bibliographisches Institut (1980).
CONF-7906202-	(IAEE/RFF international energy strategies conference, Washington, DC, USA, 4-6 Jun 1979)	
	6:18742	Cambridge, MA; Oelgeschlager, Gunn & Hain, Publishers, Inc. (1980).
CONF-7906210-	(Conference on lighting issues in the 1980's, New York, NY, USA, 14-15 Jun 1979)	
	6:18815	GPO
CONF-790743-	(Symposium on heavy ion physics from 10-200 MeV/A, Upton, NY, USA, 16-20 Jul 1979)	
(Vol.1)	6:19119	*See* BNL-51115(Vol.1)
(Vol.1)	6:19120	*See* BNL-51115(Vol.1)
(Vol.1)	6:19456	*See* BNL-51115(Vol.1)
(Vol.1)	6:19467	*See* BNL-51115(Vol.1)
(Vol.1)	6:19468	*See* BNL-51115(Vol.1)
(Vol.1)	6:19469	*See* BNL-51115(Vol.1)
(Vol.1)	6:19476	*See* BNL-51115(Vol.1)
(Vol.1)	6:19489	*See* BNL-51115(Vol.1)
(Vol.1)	6:19490	*See* BNL-51115(Vol.1)
(Vol.1)	6:19491	*See* BNL-51115(Vol.1)
(Vol.2)	6:19121	*See* BNL-51115(Vol.2)
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(Vol.2)	6:19123	*See* BNL-51115(Vol.2)
(Vol.2)	6:19124	*See* BNL-51115(Vol.2)
(Vol.2)	6:19143	*See* BNL-51115(Vol.2)
(Vol.2)	6:19144	*See* BNL-51115(Vol.2)
(Vol.2)	6:19463	*See* BNL-51115(Vol.2)
(Vol.2)	6:19466	*See* BNL-51115(Vol.2)
(Vol.2)	6:19470	*See* BNL-51115(Vol.2)
(Vol.2)	6:19471	*See* BNL-51115(Vol.2)
(Vol.2)	6:19472	*See* BNL-51115(Vol.2)
(Vol.2)	6:19479	*See* BNL-51115(Vol.2)
(Vol.2)	6:19480	*See* BNL-51115(Vol.2)
(Vol.2)	6:19481	*See* BNL-51115(Vol.2)
(Vol.2)	6:19482	*See* BNL-51115(Vol.2)
(Vol.2)	6:19492	*See* BNL-51115(Vol.2)
(Vol.2)	6:19493	*See* BNL-51115(Vol.2)
(Vol.2)	6:19494	*See* BNL-51115(Vol.2)
(Vol.2)	6:19495	*See* BNL-51115(Vol.2)
(Vol.2)	6:19496	*See* BNL-51115(Vol.2)
(Vol.2)	6:19497	*See* BNL-51115(Vol.2)
(Vol.2)	6:19498	*See* BNL-51115(Vol.2)
CONF-790748-	(Conference on peak load pricing and thermal energy storage, Chicago, IL, USA, 15-17 Jul 1979)	
	6:18708	NTIS, PC A08/MF A01
	6:18709	NTIS, PC A08/MF A01
	6:18710	NTIS, PC A08/MF A01
	6:18711	NTIS, PC A08/MF A01
	6:18712	NTIS, PC A08/MF A01
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	6:18720	NTIS, PC A08/MF A01
	6:18721	NTIS, PC A08/MF A01
	6:18722	NTIS, PC A08/MF A01
	6:18723	NTIS, PC A08/MF A01
	6:18724	NTIS, PC A08/MF A01
	6:18725	NTIS, PC A08/MF A01
	6:18757	NTIS, PC A08/MF A01

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CONF-790899-	(14. Pacific science congress, Khabarovsk, USSR, Aug 1979)	
2	6:19426	*See* UH-511-365-79
CONF-7909200-	(Conference on volatile organic compound emmission control, Atlanta, GA, USA, 18-19 Sep 1979)	
1	6:19208	Frankfort, KY; Department for Natural Resources and Environmental Protection (1979).
2	6:19209	West Chester, PA; OXY-Catalyst, Inc., MET-PRO Corp. (1979).
CONF-791056-	(Waterpower 79 international conference: small scale hydropower, Washington, DC, USA, 1-3 Oct 1979)	
	6:18147	NTIS, FC A99/MF A01
	6:18148	NTIS, PC A99/MF A01
	6:18149	NTIS, PC A99/MF A01
	6:18150	NTIS, PC A99/MF A01
	6:18151	NTIS, PC A99/MF A01
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	6:18221	NTIS, PC A99/MF A01
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	6:18224	NTIS, PC A99/MF A01
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	6:18760	NTIS, PC A99/MF A01
	6:18761	NTIS, PC A99/MF A01
	6:18762	NTIS, PC A99/MF A01
	6:18763	NTIS, PC A99/MF A01
CONF-7910212-	(Conference on passive solar housing, Saskatoon, Saskatchewan, Canada, 13-14 Oct 1979)	
	6:18824	NTIS (US Sales Only), PC A03/MF A01
CONF-7911142-	(Conference on energy prices, inflation, and economic activity, Cambridge, MA, USA, 9-11 Nov 1979)	
	6:19245	Cambridge, MA; Ballinger Publishing Company (1981).
CONF-800161-	(Workshop on physical oceanography related to the subseabed disposal of high-level nuclear waste, Big Sky, MT, USA, 14-16 Jan 1980)	
	6:19414	*See* SAND-80-1776
CONF-800204-	(Energy-sources technology conference, New Orleans, LA, USA, 3-7 Feb 1980)	
(Vol.2)	6:18033	New York, NY; American Society of Mechanical Engineers (1979).
CONF-800325-	(ASME symposium on fusion energy products, Albuquerque, NM, USA, 20-21 Mar 1980)	
	6:19557	Albuquerque, NM; American Society of Mechanical Engineers (1980).
CONF-800362-	(25. anniversary of the discovery of mendelevium meeting, Berkeley, CA, USA, 28 Mar 1980)	
	6:19042	*See* LBL-11599
	6:19043	*See* LBL-11599
	6:19485	*See* LBL-11599
CONF-800411-	(SPE/DOE symposium on enhanced oil recovery, Tulsa, OK, USA, 20-23 Apr 1980)	
(Suppl.)	6:17974	NTIS, PC A04/MF A01M -92a
(Suppl.)	6:17975	NTIS, PC A04/MF A01
(Suppl.)	6:17976	NTIS, PC A04/MF A01
(Suppl.)	6:17977	NTIS, PC A04/MF A01
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(Suppl.)	6:17982	NTIS, PC A04/MF A01
(Suppl.)	6:18034	NTIS, PC A04/MF A01
(Suppl.)	6:18037	NTIS, PC A04/MF A01
CONF-800483-	(2. annual conference on industrial energy conservation technology and exhibition, Houston, TX, USA, 13-16 Apr 1980)	
(Vol.1)	6:18032	NTIS, PC A20/MF A01
(Vol.1)	6:18041	NTIS, PC A20/MF A01
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(Vol.1)	6:18911	NTIS, PC A20/MF A01
(Vol.2)	6:17948	NTIS, PC A19/MF A01
CONF-8004149-	(Workshop on radiation treatment of sewage sludge, Bombay, India, 18 Apr 1980)	
	6:19275	NTIS (US Sales Only), PC A04/MF A01
CONF-800544-	(Electrochemical Society meeting, St Louis, MO, USA, 11-16 May 1980)	
3	6:18955	NTIS, PC A02/MF A01
CONF-800561-	(International conference on ordering in two dimensions, Lake Geneva, WI, USA, 28-30 May 1980)	
3	6:19021	NTIS, PC A02/MF A01
CONF-8005153-	(International seminar on energy policy and federalism in North America, Banff, Alberta, Canada, 14-16 May 1980)	
	6:18746	Toronto, Ontario; The Institute of Public Administration of Canada (1981).
CONF-8005155-	(2. annual industrial program grantee conference, Hot Springs, AR, USA, 14 May 1980)	
1	6:18737	NTIS, PC A02/MF A01
CONF-8005157-	(5. international congress on marine corrosion and fouling, Barcelona, Spain, May 1980)	
1	6:18340	*See* DOE/CH/10030-1
CONF-8005158-	(AS/ISES annual meeting, Philadelphia, PA, USA, 27-30 May 1980)	
1	6:18246	*See* SAND-80-2581C
CONF-800604-	(American section of the International Solar Energy Society conference, Phoenix, AZ, USA, 2-6 Jun 1980)	
P2	6:18244	NTIS, PC A99/MF A01
P2	6:18245	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 3-7(1980)
P2	6:18251	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 271-275(1980)
P2	6:18287	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 76-79(1980)
P2	6:18288	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 81-83(1980)
P2	6:18289	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 88-89(1980)
P2	6:18290	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 90-93(1980)

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P2	6:18291	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 104-109(1980)
P2	6:18292	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 110-114(1980)
P2	6:18293	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 118-121(1980)
P2	6:18294	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 122-125(1980)
P2	6:18295	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 126-129(1980)
P2	6:18296	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 130-134(1980)
P2	6:18297	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 135-138(1980)
P2	6:18308	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 281-285(1980)
P2	6:18325	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 151-160(1980)
P2	6:18326	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 161(1980)
P2	6:18327	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 481-484(1980)
P2	6:18328	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 515-518(1980)
P2	6:18329	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 519-523(1980)
P2	6:18330	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 524-528(1980)
P2	6:18331	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 534-538(1980)
P?	6:18332	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 539-543(1980)
P2	6:18333	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 558-562(1980)
P2	6:18334	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 563-567(1980)
P2	6:18335	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 572(1980)
P2	6:18336	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 578-580(1980)
P2	6:18337	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 581-585(1980)
P2	6:18338	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 586-590(1980)
P2	6:18339	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 591-595(1980)
P2	6:18381	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 11-15(1980)
P2	6:18382	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 16-23(1980)
P2	6:18383	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 24-28(1980)
P2	6:18384	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 29-33(1980)
P2	6:18385	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 34-38(1980)
P2	6:18386	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 39-43(1980)
P2	6:18387	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 54-58(1980)
P2	6:18388	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 59-63(1980)
P2	6:18389	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 64-66(1980)
P2	6:18390	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 67-71(1980)
P2	6:18391	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 144-145(1980)
P2	6:18392	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 167-171(1980)
P2	6:18393	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 172-176(1980)
P2	6:18394	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 177-181(1980)
P2	6:18395	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 182-185(1980)
P2	6:18396	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 186-190(1980)
P2	6:18397	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 191-195(1980)
P2	6:18398	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 196-199(1980)
P2	6:18399	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 200-204(1980)
P2	6:18400	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 205-209(1980)
P2	6:18401	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 210-214(1980)
P2	6:18402	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 215-219(1980)
P2	6:18403	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 224-227(1980)
P2	6:18404	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 228-232(1980)
P2	6:18405	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 233-237(1980)
P2	6:18406	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 238-242(1980)
P2	6:18407	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 247-250(1980)
P2	6:18408	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 261-265(1980)
P2	6:18409	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 266-270(1980)
P2	6:18410	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 286-290(1980)
P2	6:18411	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 296-299(1980)
P2	6:18412	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 304-308(1980)
P2	6:18413	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 314-318(1980)
P2	6:18414	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 319-323(1980)
P2	6:18415	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 324-328(1980)
P2	6:18416	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 329-333(1980)
P2	6:18417	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 334-338(1980)
P2	6:18418	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 339-343(1980)

Report No.	Abstract No.	Availability
P2	6:18419	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 349-353(1980)
P2	6:18420	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 345-358(1980)
P2	6:18421	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 359-363(1980)
P2	6:18422	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 359-363(1980)
P2	6:18423	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 478-480(1980)
P2	6:18424	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 568-571(1980)
P2	6:18425	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 626-630(1980)
P2	6:18426	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 631-635(1980)
P2	6:18427	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 636-638(1980)
P2	6:18428	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 639-643(1980)
P2	6:18429	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 654-658(1980)
P2	6:18430	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 659-663(1980)
P2	6:18431	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 664-666(1980)
P2	6:18432	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 672-675(1980)
P2	6:18433	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 676-680(1980)
P2	6:18434	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 681-685(1980)
P2	6:18435	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 686-690(1980)
P2	6:18448	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 44-48(1980)
P2	6:18449	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 94-98(1980)
P2	6:18450	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 99-103(1980)
P2	6:18451	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 291-295(1980)
P2	6:18452	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 300-303(1980)
P2	6:18453	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 376-380(1980)
P2	6:18454	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 381-385(1980)
P2	6:18455	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 386-390(1980)
P2	6:18456	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 391-394(1980)
P2	6:18457	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 395-399(1980)
P2	6:18458	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 400-404(1980)
P2	6:18459	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 405-409(1980)
P2	6:18460	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 410-414(1980)
P2	6:18461	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 415-419(1980)
P2	6:18462	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 420-423(1980)
P2	6:18463	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 423-427(1980)
P2	6:18464	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 428-432(1980)
P2	6:18465	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 433-436(1980)
P2	6:18466	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 437-440(1980)
P2	6:18467	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 441-445(1980)
P2	6:18468	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 446-450(1980)
P2	6:18469	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 451-455(1980)
P2	6:18470	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 456-460(1980)
P2	6:18471	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 461-464(1980)
P2	6:18472	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 465-469(1980)
P2	6:18473	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 470-474(1980)
P2	6:18474	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 485-487(1980)
P2	6:18475	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 488-490(1980)
P2	6:18476	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 496-500(1980)
P2	6:18477	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 505-509(1980)
P2	6:18478	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 510-514(1980)
P2	6:18479	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 529-533(1980)
P2	6:18480	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 544-547(1980)
P2	6:18481	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 548-552(1980)
P2	6:18482	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 596-599(1980)
P2	6:18483	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 600-604(1980)
P2	6:18484	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 605-609(1980)
P2	6:18485	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 610-614(1980)
P2	6:18486	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 615-617(1980)
P2	6:18494	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 243-246(1980)

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P2	6:18495	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 251-256(1980)
P2	6:18496	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 256-260(1980)
P2	6:18497	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 276-280(1980)
P2	6:18844	Proc. Annu. Meet. - Am. Sect. Int. Sol. Energy Soc., 3.1: 220-223(1980)
CONF-800611-	(International symposium on the management of alpha-contaminated wastes, Vienna, Austria, 2-6 Jun 1980)	
	6:18102	*See* STI/PUB-562
CONF-800617-	(7. international conference on MHD electrical power generation, Cambridge, MA, USA, 16-20 Jun 1980)	
(Vol.1)	6:18778	Cambridge, MA; Massachusetts Institute of Technology (1980).
CONF-800680-	(Symposium on health effects investigations of oil shale development, Gatlinburg, TN, USA, 23-24 Jun 1980)	
	6:19370	Ann Arbor, MI; Ann Arbor Science Publishers, Inc. (1981).
CONF-800681-	(EPRI geothermal workshop, Monterey, CA, USA, 23-27 Jun 1980)	
	6:18500	*See* EPRI-TC-80-907
	6:18506	*See* EPRI-TC-80-907
	6:18508	*See* EPRI-TC-80-907
	6:18509	*See* EPRI-TC-80-907
	6:18510	*See* EPRI-TC-80-907
	6:18511	*See* EPRI-TC-80-907
	6:18512	*See* EPRI-TC-80-907
CONF-8006158-	(Conference on metallic glasses: science and technology, Budapest, Hungary, Jun 1980)	
1	6:19507	NTIS, PC A02/MF A01
2	6:18956	NTIS, PC A02/MF A01
CONF-800724-	(20. international conference on high energy physics, Madison, WI, USA, 17-23 Jul 1980)	
(Vol.1)	6:19446	Schenectady, NY; American Institute of Physics (1981).
(Vol.2)	6:19447	Schenectady, NY; American Institute of Physics (1981).
CONF-800763-	(Baryon 80 conference, Toronto, Canada, 14-16 Jul 1980)	
6	6:19454	*See* FERMILAB-CONF-80/98-THY
CONF-800787-	(International school of physics enrico fermi, Varenna, Lake Como, Italy, Jul 1980)	
2	6:19455	*See* FERMILAB-Conf-80/101-THY
4	6:19451	*See* FERMILAB-Conf-80/99-THY
CONF-800796-	(Symposium on California and world oil: the strategic horizon, Los Angeles, CA, USA, 17-19 Jul 1980)	
	6:17927	*See* P-300-81-002
	6:17928	*See* P-300-81-002
	6:18036	*See* P-300-81-002
	6:18752	*See* P-300-81-002
CONF-800824-	(5. international symposium on polarization phenomena in nuclear physics, Santa Fe, NM, USA, 11-15 Aug 1980)	
(Vol.1)	6:19458	Copyright Clearance Center, Inc., Schenectady, NY
(Vol.2)	6:19459	Copyright Clearance Center, Inc., Schenectady, NY
CONF-800966-	(Conference on waste heat recovery for energy conservation: residential and light commercial heat pumps, West Lafayette, IN, USA, 15-17 Sep 1980)	
	6:18736	NTIS, PC A09/MF A01
	6:18822	NTIS, PC A09/MF A01
	6:18823	NTIS, PC A09/MF A01
CONF-800973-	(11. biomass thermochemical conversion contractors meeting, Richland, WA, USA, 23-24 Sep 1980)	
3	6:18276	*See* SERI/TP-622-1139
CONF-800979-	(Workshop on nuclear data evaluation methods and procedures, Upton, NY, USA, 22-25 Sep 1980)	
15	6:19504	*See* UCRL-84847
CONF-8009136-	(Workshop in nuclear physics, Philadelphia, PA, USA, 1-5 Sep 1980)	
2	6:19488	*See* BNL-29137
CONF-8009142-	(Symposium of the history of the ZGS, Argonne, IL, USA, 13-14 Sep 1980)	
1	6:19142	*See* ANL-HEP-CP-80-19
CONF-801010-	(12. National Society for the Advancement of Materials and Process Engineering technical conference, Seattle, WA, USA, 7-9 Oct 1980)	
	6:18534	SAMPE J., 12: 1095-1103(1980)
	6:19000	Azusa, CA; SAMPE National Business Office (1980).
CONF-801011-	(4. ANS topical meeting on the technology of controlled nuclear fusion, King of Prussia, PA, USA, 14-17 Oct 1980)	
83	6:19569	*See* UCRL-85162
84	6:19566	*See* UCRL-84229
CONF-8010127-	(Neutrino mass mini-conference, Cable, WI, USA, 1-5 Oct 1980)	
7	6:19439	*See* BNL-29357
CONF-8010140-	(MOE/DOE seminar, Mito, Japan, 27-29 Oct 1980)	
2	6:19547	*See* HEDL-SA-2250
CONF-8010176-	(Economy energy and electricity conference, Toronto, Ontario, Canada, 14-15 Oct 1980)	
1	6:18771	New York, NY; Gibbs and Hill, Inc. (1980).
CONF-801104-	(73. annual meeting of the American Institute of Chemical Engineers, Chicago, IL, USA, 12-16 Nov 1980)	
14	6:18300	Chicago, IL; Institute of Gas Technology (1980).
CONF-801139-	(Electro-optics/laser conference, Boston, MA, USA, 19-21 Nov 1980)	
3	6:19546	*See* GA-A-16128
CONF-801172-	(Tree crops for energy co-production on farms, Estes Park, CO, USA, 12-14 Nov 1980)	
	6:18269	*See* SERI/CP-622-1086
	6:18270	*See* SERI/CP-622-1086
CONF-801244-	(Workshop on weak interactions as probes of unification, Blacksburg, VA, USA, 3-6 Dec 1980)	
7	6:19445	*See* SLAC-PUB-2699
CONF-801252-	(IGT symposium on peat as an energy alternative, Arlington, VA, USA, 1-3 Dec 1980)	
1	6:17958	Chicago, IL; IIT Center (1980).
2	6:17946	Chicago, IL; Institute of Gas Technology (1980).
CONF-810101-	(American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) meeting, Chicago, IL, USA, 25-29 Jan 1981)	
8	6:18843	Chicago, IL; Institute of Gas Technology (1981).
CONF-810116-	(5. annual IGT meeting on energy from biomass and wastes, Lake Buena Vista, FL, USA, 26-30 Jan 1981)	
3	6:18277	*See* SERI/TP-623-1073
CONF-810134-	(Orbis scientiae conference, Fort Lauderdale, FL, USA, 19-22 Jan 1981)	
1	6:19450	*See* DOE/ER/01545-298
CONF-810135-	(Neutrino oscillation workshop, Upton, NY, USA, 30 Jan 1981)	
1	6:19453	*See* BNL-29092
2	6:19128	*See* LA-UR-81-1010
CONF-810136-	(Conference on testing and validating algorithms and software, Boulder, CO, USA, 5-6 Jan 1981)	
1	6:19609	*See* SAND-81-0797C
CONF-810137-	(Solar thermal test facility (STTF) workshop: STTF testing for long-term system performance, Albuquerque, NM, USA, 7-9 Jan 1981)	
1	6:18444	*See* SAND-81-0075C
CONF-810202-	(5. Berkeley workshop on distributed data management and computer networks, Berkeley, CA, USA, 3-5 Feb 1981)	
	6:19621	*See* LBL-11860
CONF-810203-	(AIME annual meeting, Chicago, IL, USA, 22-26 Feb 1981)	
8	6:18954	*See* BNL-29058
CONF-810206-	(Society of Automotive Engineers international engineering congress and exposition, Detroit, MI, USA, 23-27 Feb 1981)	
7	6:18923	Warrendale, PA; Society of Automotive Engineers, Inc. (1981).
8	6:18949	Warrendale, PA; Society of Automotive Engineers, Inc. (1981).
9	6:18924	Warrendale, PA; Society of Automotive Engineers, Inc. (1981).

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10	6:18943	Warrendale, PA; Society of Automotive Engineers, Inc. (1981).
11	6:18944	Warrendale, PA; Society of Automotive Engineers, Inc. (1981).
12	6:18945	Warrendale, PA; Society of Automotive Engineers, Inc. (1981).
13	6:18925	Warrendale, PA; Society of Automotive Engineers, Inc. (1981).
14	6:18951	Warrendale, PA; Society of Automotive Engineers, Inc. (1981).
15	6:18946	Warrendale, PA; Society of Automotive Engineers, Inc. (1981).
16	6:18947	Warrendale, PA; Society of Automotive Engineers, Inc. (1981).
17	6:18926	Warrendale, PA; Society of Automotive Engineers, Inc. (1981).
18	6:18935	Warrendale, PA; Society of Automotive Engineers, Inc. (1981).
19	6:18936	Warrendale, PA; Society of Automotive Engineers, Inc. (1981).
20	6:18919	Warrendale, PA; Society of Automotive Engineers, Inc. (1981).
21	6:18920	Warrendale, PA; Society of Automotive Engineers, Inc. (1981).
22	6:18948	Warrendale, PA; Society of Automotive Engineers, Inc. (1981).
23	6:18937	Warrendale, PA; Society of Automotive Engineers, Inc. (1981).
24	6:18938	Warrendale, PA; Society of Automotive Engineers, Inc. (1981).
25	6:18939	Warrendale, PA; Society of Automotive Engineers, Inc. (1981).
26	6:18940	Warrendale, PA; Society of Automotive Engineers, Inc. (1981).
27	6:18941	Warrendale, PA; Society of Automotive Engineers, Inc. (1981).
28	6:18950	Warrendale, PA; Society of Automotive Engineers, Inc. (1981).
29	6:18942	Warrendale, PA; Society of Automotive Engineers, Inc. (1981).
30	6:18921	Warrendale, PA; Society of Automotive Engineers, Inc. (1981).
31	6:18922	Warrendale, PA; Society of Automotive Engineers, Inc. (1981).
CONF-810217-	(ANS waste management conference, Tucson, AZ, USA, 23-26 Feb 1981)	
13	6:18118	*See* SAND-80-2043C
CONF-810227-	(SAS users group international meeting, Lake Buena Vista, FL, USA, 8-11 Feb 1981)	
3	6:19619	NTIS, PC A02/MF A01
CONF-810237-	(4. annual wood energy program and contractor review meeting, Washington, DC, USA, 9-12 Feb 1981)	
1	6:18255	*See* COO-2982-67
CONF-810242-	(36. annual conference of the reinforced plastics/ composites institute, Washington, DC, USA, 16-20 Feb 1981)	
1	6:18999	*See* COO-4440-8
CONF-810246-	(Z/sup o/ physics workshop, Ithaca, NY, USA, 6-8 Feb 1981)	
1	6:19442	*See* FERMILAB-CONF-81/28-THY
CONF-810247-	(ICN-UCLA symposia on mechanisms in chemical carcinogenesis, Keystone, CO, USA, 22 Feb-1 Mar 1981)	
1	6:19265	*See* UCRL-85849
CONF-810307-	(3. specialist meeting on transient two-phase flow, Pasadena, CA, USA, 23-25 Mar 1981)	
2	6:18615	*See* LA-UR-81-875
CONF-810310-	(IEEE international conference on acoustics, speech and signal processing, Atlanta, GA, USA, 30 Mar-1 Apr 1981)	
2	6:19094	*See* UCRL-85276
CONF-810314-	(Particle accelerator conference, Washington, DC, USA, 11-13 Mar 1981)	
108	6:19139	*See* SLAC-PUB-2681
109	6:19105	*See* BNL-29302
110	6:19106	*See* BNL-29329
111	6:19112	*See* SLAC-PUB-2680
112	6:19130	*See* LBL-11693
113	6:19131	*See* LBL-11714
114	6:19132	*See* LBL-11718
115	6:19109	*See* LBL-11743
116	6:19104	*See* BNL-29199
117	6:19137	*See* LBL-12456
118	6:19062	*See* LBL-11754
119	6:19133	*See* LBL-11744
120	6:19553	*See* LBL-11745
121	6:19110	*See* LBL-11748
122	6:19134	*See* LBL-11752
123	6:19111	*See* LBL-11750
124	6:19141	*See* LBL-11753
125	6:19108	*See* LBL-11741
CONF-810315-	(8. energy technology conference and exposition, Washington, DC, USA, 9-11 Mar 1981)	
10	6:18282	Chicago, IL; Institute of Gas Technology (1981).
CONF-810319-	(3. symposium on the transfer and utilization of particulate control technology, Orlando, FL, USA, 9-12 Mar 1981)	
2	6:19196	NTIS, PC A02/MF A01
CONF-810326-	(Jahrestagung Kerntechnik, Dusseldorf, F.R. Germany, 24-26 Mar 1981)	
2(Rev.1)	6:19567	*See* UCRL-84826(Rev.1)
CONF-810330-	(Combustion Institute/Central States Section technical meeting, Warren, MI, USA, 23-24 Mar 1981)	
2	6:18917	*See* SAND-81-8637
CONF-810332-	(10. DOE conference of surface studies and 5. SUBWOB-12B technical exchange, Livermore, CA, USA, 10-13 Mar 1981)	
1	6:19040	*See* MLM-2806(OP)
CONF-810334-	(Workshop on high speed computing, Gleneden Beach, OR, USA, 31 Mar 1981)	
2	6:19616	*See* UCRL-85442
CONF-810340-	(7. international conference on magnet technology, Karlsrube, F.R. Germany, 30 Mar-3 Apr 1981)	
4	6:19118	*See* BNL-29317
5	6:19127	*See* LA-UR-81-973
6	6:19135	*See* LBL-12233
CONF-810348-	(Northwest Scientific Association meeting, Corvallis, OR, USA, 26-28 Mar 1981)	
1	6:19229	*See* RHO-SA-214
CONF-810349-	(High efficiency concentrator and III-V compound contractors in depth review meeting, Raleigh, NC, USA, 31 Mar-2 Apr 1981)	
1	6:18254	NTIS, PC A02/MF A01
CONF-810352-	(International Atomic Energy Agency conference, Vienna, Austria, 23-27 Mar 1981)	
1	6:19548	*See* HEDL-SA-2360
CONF-810353-	(Solar desalination workshop, Denver, CO, USA, 23-25 Mar 1981)	
(Vol.1)	6:18241	*See* SERI/CP-761-1077(Vol.1)
(Vol.1)	6:18322	*See* SERI/CP-761-1077(Vol.1)
(Vol.1)	6:18362	*See* SERI/CP-761-1077(Vol.1)
(Vol.1)	6:18363	*See* SERI/CP-761-1077(Vol.1)
(Vol.1)	6:18364	*See* SERI/CP-761-1077(Vol.1)
CONF-810354-	(Weapons agencies nondestructive test organization meeting, Golden, CO, USA, 10-12 Mar 1981)	
1	6:19182	*See* LA-UR-81-1016
CONF-810355-	(CSNI heat transfer conference, Pasadena, CA, USA, 23-25 Mar 1981)	
1	6:18613	NTIS, PC A02/MF A01
CONF-810356-	(Workshop on long-time prediction in nonlinear conservative dynamical systems, Austin, TX, USA, 16-19 Mar 1981)	
1	6:19107	*See* FERMILAB-CONF-81/29-THY

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CONF-810357-		(7. FDA's science symposium on photochemical toxicity, Bethesda, MA, USA, 16-17 Mar 1981)
1	6:19320	*See* LA-UR-81-986
CONF-810358-		(Texas Instruments-members information exchange symposium, New Orleans, LA, USA, 8-11 Mar 1981)
1	6:19594	*See* LBL-12235
CONF-810415-		(ANS/ENS joint topical meeting on mathematical methods in nuclear engineering, Munich, F.R. Germany, 27-29 Apr 1981)
5	6:19513	NTIS, PC A02/MF A01
CONF-810423-		(1. International Energy Agency (IEA) conference on new energy conservation technologies and their commercialization, Berlin, F.R. Germany, 6-10 Apr 1981)
5	6:18369	*See* SERI/TP-721-1167
CONF-810429-		(Conference on optics, Santa Fe, NM, USA, 6-10 Apr 1981)
6	6:19433	*See* LA-UR-81-972
CONF-810438-		(2. joint SPE/DOE symposium on enhanced oil recovery, Tulsa, OK, USA, 5-8 Apr 1981)
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CONF-810439-		(15. AIAA/JSASS/DGLR international electromagnetic propulsion conference, Las Vegas, NV, USA, 21-23 Apr 1981)
1	6:19067	*See* UCRL-84958
CONF-810440-		(Princeton conference on computer graphics applications, Princeton, NJ, USA, 2-3 Apr 1981)
1	6:19588	NTIS, PC A02/MF A01
CONF-810441-		(Symposium in honor of Lewis Cochran, Lexington, KY, USA, 10 Apr 1981)
1	6:19430	NTIS, PC A03/MF A01
CONF-810442-		(Joint workshop on negative ions, Mexico City, Mexico, 1-4 Apr 1981)
1	6:19570	*See* UCRL-85589
CONF-810443-		(NYU cogeneration conference, New York, NY, USA, 6-7 Apr 1981)
1	6:18817	*See* BNL-29221
CONF-810444-		(International conference on electric energy, Oklahoma City, OK, USA, 13-15 Apr 1981)
1	6:18745	NTIS, PC A02/MF A01
CONF-810445-		(International reliability physics symposium, Orlando, FL, USA, 7-9 Apr 1981)
1	6:19088	NTIS, PC A02/MF A01
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CONF-810447-		(Wind power: energy alternative for the upper Midwest, Rochester, MN, USA, 3-4 Apr 1981)
1	6:18528	*See* SERI/TP-744-1099
CONF-810449-		(7. ANMC annual conference on productivity opportunities of metrication, Washington, DC, USA, 13 Apr 1981)
1	6:19586	NTIS, PC A03/MF A01
CONF-810451-		(Engineering Society of Detroit graphics conference, Detroit, MI, USA, 28-30 Apr 1981)
1	6:19610	*See* SAND-81-0815C
CONF-810454-		(Atomic industrial forum licensing workshop, New Orleans, LA, USA, 14 Apr 1981)
1	6:18624	*See* SAND-81-0920C
CONF-810455-		(Mexican American Engineering Society conference, Fullerton, CA, USA, 13-15 Apr 1981)
1	6:19063	*See* SAND-80-2794C
CONF-810456-		(14. oil shale symposium, Golden, CO, USA, 22-24 Apr 1981)
1	6:18054	*See* SAND-80-2686C
2	6:18062	*See* UCRL-85279
CONF-810457-		(29. annual meeting of the American Association of Petroleum Geologists, Albuquerque, NM, USA, 14 Apr 1981)
1	6:19386	*See* SAND-81-0197C
CONF-810459-		(Technical and economic analysis contractors' meeting, Chicago, IL, USA, 21-22 Apr 1981)
1	6:19622	*See* UCRL-85853
2	6:18933	*See* UCRL-85851
CONF-810502-		(3. symposium on safeguards and nuclear material management, Karlsruhe, F.R. Germany, 6 May-8 Mar 1981)
2	6:18128	*See* SAND-81-1027C
CONF-810509-		(Annual conference of the International Solar Energy Society, Philadelphia, PA, USA, 26-30 May 1981)
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16	6:18842	*See* SERI/TP-722-1169
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24	6:18372	*See* SERI/TR-721-907
25	6:18492	*See* LA-UR-81-981
27	6:18359	*See* LA-UR-81-987
CONF-810518-		(Joint SPE/DOE symposium, Denver, CO, USA, 27-29 May 1981)
6	6:18047	*See* SAND-80-2351C
CONF-810520-		(Symposium on separation science and technology for energy applications, Gatlinburg, TN, USA, 5-8 May 1981)
3	6:19016	*See* RFP-3187
CONF-810523-		(Topical conference on computerized data acquisition in particle and nuclear physics, Oak Ridge, TN, USA, 28-30 May 1981)
1	6:19526	*See* UCRL-85480
CONF-810524-		(International symposium on mechanical behavior of structured media, Ottawa, CA, USA, 18-21 May 1981)
1	6:19085	*See* SAND-80-1558C
2	6:19086	*See* SAND-80-1559C
CONF-810526-		(15. IEEE PV specialists conference, Orlando, FL, USA, 11-15 May 1981)
2	6:18304	*See* DOE/ET/20279-127
CONF-810527-		(International conference on plasma science, Sante Fe, NM, USA, 18-20 May 1981)
1	6:18538	*See* DOE/NASA/1062-8
CONF-810529-		(IEEE custom integrated circuits conference, Rochester, NY, USA, 11-13 May 1981)
1	6:19093	*See* SAND-81-0999C
CONF-810530-		(IAEA specialists' meeting on high-temperature metallic materials for application in gas-cooled reactors, Vienna, Austria, 4-5 May 1981)
2	6:18588	*See* GA-A-16314
3	6:18589	*See* GA-A-16319

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1	6:19090	*See* SAND-81-0426C
2	6:19092	*See* SAND-81-0945C
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1	6:19593	*See* LA-UR-80-2422
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5	6:19179	*See* UCRL-84999
7	6:19165	*See* LA-UR-81-705
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10	6:19166	*See* LA-UR-81-706
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15	6:19175	*See* UCRL-84986
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19	6:19168	*See* LA-UR-81-872
20	6:19167	*See* LA-UR-81-871
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1	6:19614	*See* UCRL-84954
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2	6:19005	*See* GA-A-16197
CONF-810606-	(American Nuclear Society's annual meeting, Miami Beach, FL, USA, 7-12 Jun 1981)	
2	6:18623	*See* SAND-81-0112C
3	6:18126	*See* SAND-80-2592C
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1	6:19429	*See* BNL-28758
3	6:19033	*See* BNL-28756
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1	6:19605	*See* SAND-80-2735C
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1	6:17972	*See* SAND-81-0239C
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2	6:19153	*See* LA-UR-81-171
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4	6:19436	*See* SAND-81-0110
5	6:19437	*See* SAND-81-0178C
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1	6:17973	*See* SAND-81-0492C
2	6:19161	*See* UCRL-85102
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1	6:18267	*See* SAND-81-0286C
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1	6:18521	*See* LA-UR-81-534
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1	6:19568	*See* UCRL-84922
2	6:18965	*See* SAND-81-2742C
CONF-810620-	(4. international topical conference on high-power electron and ion-beam research and technology, Palaiseau, France, 29 Jun-3 Jul 1981)	
1	6:19552	*See* LA-UR-81-433
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1	6:19054	*See* UCRL-85560
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1	6:19607	*See* SAND-81-0468C
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1	6:19398	*See* LA-UR-81-887
2	6:19407	*See* UCRL-85736
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4	6:18087	*See* UCRL-85768
5	6:19406	*See* UCRL-85285
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1	6:18358	*See* LA-UR-81-903
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1	6:19434	*See* LBL-12367
2	6:19200	*See* LA-UR-81-800
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1	6:18835	*See* LBL-12189
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1	6:18931	*See* DOE/NASA/51044-18
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1	6:19408	*See* UCRL-85871
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159672	6:18914	*See* DOE/NASA/2749-79/3
159673	6:18915	*See* DOE/NASA/2749-79/4
165170	6:18912	*See* DOE/NASA/0106-1
165250	6:18916	Pratt & Whitney Aircraft Group, East Hartford, CT
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81626	6:18807	*See* DOE/NASA/1062-7
81677	6:18538	*See* DOE/NASA/1062-8
81685	6:18959	*See* DOE/NASA/2593-26
81760	6:18931	*See* DOE/NASA/51044-18
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578	6:19036	NTIS, PC A03/MF A01
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0029	6:18263	NTIS, PC A04/MF A01
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204/ A(Rev.)	6:18134	*See* DOE/NDC-13(Rev.)
NP-		
25310	6:18963	NTIS (US Sales Only), PC A02/ MF A01
25311	6:18130	Washington, DC; State Planning Council on Radioactive Waste Management (1981).
25323	6:18769	EPRI, Palo Alto, CA
25324	6:18907	EPRI, Palo Alto, CA
25352	6:18542	EPRI, Palo Alto, CA
25364	6:17945	Austin, TX; University of Texas (1980).
25367	6:18498	New Mexico Energy and Minerals Department, Sante Fe
25373	6:18755	Sacramento, CA; California Energy Commission (1980).
25374	6:18768	Sacramento, CA; California Energy Commission (1981).
25378	6:17940	NTIS, PC A04/MF A01
25379	6:18909	Sacramento, CA; California Energy Commission (1980).
25380	6:17943	Austin, TX; University of Texas (1980).
25381	6:18750	NTIS, PC A08/MF A01
25383	6:18756	Washington, DC; Americans for Energy Independence (1980).
25386	6:18910	Sacramento, CA; California Energy Commission (1980).
NRL-MR-		
4493	6:19078	NTIS, PC A03/MF A01
4498	6:19554	NTIS, PC A05/MF A01
4500	6:19555	NTIS, PC A02/MF A01
4503	6:19556	NTIS, PC A03/MF A01
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80-5	6:18050	NTIS
NTSB-PSS-		
80-1	6:18051	NTIS
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0511	6:18116	Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC. (MF or HC) Order No. 79-0769
0522	6:18611	Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC. (MF or HC) Order No. 79-0656
0564	6:18610	Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC. (MF or HC) Order No. 79-0656
NYSERDA-		
81-3	6:18264	New York State Energy Research and Development Authority, Albany
NYU/DAS-		
78-25	6:18836	NTIS, PC A06/MF A01
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13	6:18114	NTIS, PC A04/MF A01
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7587	6:19600	NTIS, PC A03/MF A01
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7771	6:19602	NTIS, PC A02/MF A01
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300-80-037	6:18751	California Energy Commission, Sacramento
300-81-002	6:17927	California Energy Commission, Sacramento
300-81-002	6:17928	California Energy Commission, Sacramento
300-81-002	6:18036	California Energy Commission, Sacramento
300-81-002	6:18752	California Energy Commission, Sacramento
400-80-065	6:18837	California Energy Commission, Sacramento, CA
400-80-066	6:18838	California Energy Commission, Sacramento, CA
400-81-001	6:18839	California Energy Commission, Sacramento, CA
400-81-002	6:18840	California Energy Commission, Sacramento, CA
500-80-037	6:18908	California Energy Commission, Sacramento
500-80-051	6:18265	California Energy Commission, Sacramento
500-80-051(App)	6:18266	California Energy Commission, Sacramento
500-81-009	6:18252	California Energy Commission, Sacramento, CA
500-81-016	6:18740	California Energy Commission, Sacramento, CA
700-79-010	6:17941	California Energy Commission, Sacramento

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800-80-002	6:18505	California Energy Commission, Sacramento
PATENTS-US-		(US: Commissioner of Patents, Washington, D.C. 20231, USA, $.50 per copy. Government Patent Applications available from NTIS)
A 164,989	6:19578	
A 164,990	6:19114	
A 167,501	6:18569	
A 167,561	6:19074	
A 170,253	6:19073	
A 170,254	6:18729	
A 173,554	6:18728	
A 173,555	6:19577	
A 175,814	6:18593	
A 178,266	6:18132	
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1759	6:19560	NTIS, PC A02/MF A01
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